# PATENT ABSTRACTS OF JAPAN

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(54) **SOLID-STATE IMAGE PICK-UP DEVICE**

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a solid-state image pick-up device by which reduction in yield is suppressed and the light-receiving portion can be made large even when the light-receiving portion and the peripheral circuit are formed on the same substrate.
SOLUTION: A light-receiving part 20, a first analog signal reading-out part 30, a first digital signal reading-out part 40, a first shift register 50 and a second shift register 60, are placed on a substrate 1 by using a CMOS process or the like. The first analog signal reading-out part 30 is placed along a first side 20a of the light-receiving part 20. The first digital signal reading-out part 40 is placed along a second side 20b opposed to the first side 20a. The first shift register 50 is placed along a third side 20c orthogonal to the first side 20a and the second side 20b. The second shift register 60 is placed along the fourth side 20d orthogonal to the first side 20a and the second side 20b and opposed to the third side 20c.

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CLAIMS

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[Claim(s)]

[Claim 1] The light sensing portion of the shape of a rectangle by which it is the solid state camera which picturizes the inputted two-dimensional light figure, and the optoelectric transducer which changes an input lightwave signal into a current signal was arranged by two-dimensional, Along with one side of the light sensing portion of the shape of said rectangle, only the number corresponding to the number of said optoelectric transducers arranged in said extending direction of one side is formed. The 1st signal readout circuitry which reads the current signal generated in said optoelectric transducer arranged in the direction which intersects perpendicularly with said one side of the light sensing portion of the shape of said rectangle, Said current signal generated in said optoelectric transducer arranged in the direction which is established along with one of said one side and the two sides which intersect perpendicularly, and intersects perpendicularly with said one side of the light sensing portion of the shape of said rectangle The 1st shift register sent out towards said 1st signal readout circuitry, Said current signal generated in said optoelectric transducer arranged in the direction which is established along another side of said one side and the two sides which intersect perpendicularly, and intersects perpendicularly with said one side of the light sensing portion of the shape of said rectangle The solid state camera characterized by equipping the same substrate with the 2nd shift register which sends out said current signal towards said signal readout circuitry.

[Claim 2] Only the number corresponding to the number of said optoelectric transducers arranged in said extending direction of one side is formed along the side which counters said one side of the light sensing portion of the shape of said rectangle. The same substrate is further equipped with the 2nd signal readout circuitry which reads the current signal generated in said optoelectric transducer arranged in the direction which intersects perpendicularly with said one side of the light sensing portion of the shape of said rectangle. Said 1st shift register and said 2nd shift register The solid state camera according to claim 1 characterized by the ability to send it out even if it turns to any by the side of said 1st signal readout circuitry and said 2nd signal readout circuitry said current signal generated in said optoelectric transducer arranged in the direction which intersects perpendicularly with said one side of the light sensing portion of the shape of said rectangle.

[Claim 3] The optoelectric transducer which is the solid state camera which picturizes the inputted two-dimensional light figure, and changes an input lightwave signal into a current signal, The 1st switching device which flows out the current signal which the 1st

terminal was connected to the signal output terminal of said optoelectric transducer, and was generated in said optoelectric transducer from the 2nd terminal according to the scan signal as 1 set of photo detectors The unit light sensing portion by which only the 1st number is arranged along the 1st direction has the light sensing portion by which only the 2nd number was arranged along the 2nd direction. In one edge of each of said unit light sensing portion The 1st signal output terminal mutually connected with the 2nd terminal of each of said 1st switching device electrically is prepared. Said 2nd number of the 1st signal readout circuitries which reads the current signal which inputted the signal outputted from said 1st signal output terminal of each of said unit light sensing portion according to the individual, respectively, and was outputted from said unit light sensing portion, So that said current signal generated in said each optoelectric transducer may be turned and sent out to said 1st signal output terminal of each of said unit light sensing portion So that the 1st shift register which outputs said scan signal, and said current signal generated in said each optoelectric transducer may be turned and sent out to said 1st signal output terminal of each of said unit light sensing portion It is the solid state camera which equips the same substrate with the 2nd shift register which outputs said scan signal, and is characterized by preparing said 1st shift register and said 2nd shift register in the location which counters on both sides of said light sensing portion along said 1st direction.

[Claim 4] The 2nd signal output terminal mutually connected with the 2nd terminal of each of said 1st switching device electrically is prepared in the other-end section of each of said unit light sensing portion. The signal outputted from said 2nd signal output terminal of each of said unit light sensing portion is inputted according to an individual, respectively. The same substrate is further equipped with said 2nd number of the 2nd signal readout circuitries which reads the current signal outputted from said unit light sensing portion. Said 1st shift register and said 2nd shift register The solid state camera according to claim 3 characterized by outputting said scan signal so that it can be sent out, even if it turns to any of said 1st signal output terminal of each of said unit light sensing portion, and said 2nd signal output terminal said current signal generated in said each optoelectric transducer.

[Claim 5] The 1st analog signal readout circuitry from which said 1st signal readout circuitry reads the current signal generated in said optoelectric transducer as an analog signal, It has the 1st digital signal readout circuitry which changes and reads the output signal from said 1st analog signal readout circuitry to a digital signal. The output signal from said 1st analog signal readout circuitry Or a solid state camera given in any 1 term of claim 1 characterized by equipping the same substrate with the 1st output selection circuit which outputs selectively one output signal of the output signals from said 1st digital signal readout circuitry further - claim 4.

[Claim 6] It is the solid state camera according to claim 2 or 4 characterized by for said 1st signal readout circuitry having the 1st analog signal readout circuitry which reads the current signal generated in said optoelectric transducer as an analog signal, and said 2nd signal readout circuitry having the 2nd digital signal readout circuitry which reads the current signal generated in said optoelectric transducer as a digital signal.

[Claim 7] The 1st analog signal readout circuitry from which said 1st signal readout circuitry reads the current signal generated in said optoelectric transducer as an analog signal, It has the 1st digital signal readout circuitry which changes and reads the output

signal from said 1st analog signal readout circuitry to a digital signal. Said 2nd signal readout circuitry It has the 2nd analog signal readout circuitry which reads the current signal generated in said optoelectric transducer as an analog signal. The solid state camera according to claim 2 or 4 characterized by equipping the same substrate with the 1st output selection circuit which outputs selectively the output signal from said 1st analog signal readout circuitry, or one output signal of the output signals from said 1st digital signal readout circuitry further.

[Claim 8] Said 2nd signal readout circuitry is a solid state camera according to claim 7 characterized by equipping the same substrate with the 2nd output selection circuit which has further the 2nd digital signal readout circuitry which changes and reads the output signal from said 2nd analog signal readout circuitry to a digital signal, and outputs selectively the output signal from said 2nd analog signal readout circuitry, or one output signal of the output signals from said 2nd digital signal readout circuitry further.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the solid state camera which picturizes the inputted two-dimensional light figure.

[0002]

[Description of the Prior Art] The image pick-up equipment which used the solid state image pickup device represented by the charge-coupled device (CCD) is used in various fields including the home video. However, since charge transfer efficiency is low in CCD when dealing with the photodiode charge which has a comparatively big light-receiving area, the problem that a charge cannot be transmitted is produced. So, in a specific field, the image sensors formed among solid state cameras with the amorphous silicon which the problem of charge transfer efficiency does not produce may be used. The photo detector (pixel) which the image sensors formed with this amorphous silicon become from the optoelectric transducer which changes an input lightwave signal into a current signal, and the switching device which flows out the current signal which occurred in this optoelectric transducer is arranged by two-dimensional.

[0003]

[Problem(s) to be Solved by the Invention] However, when a light sensing portion (optoelectric transducer) is formed using an amorphous silicon, in order to read a signal from the amorphous silicon part in which the light sensing portion was formed, the silicon chip with which circumference circuits, such as a signal readout circuitry and a shift register, were formed is needed, in case bonding of the amorphous silicon part and silicon chip with which the light sensing portion was formed is carried out, it will be easy to produce the problem of poor bonding, and the yield will fall. Moreover, although the image pick-up of a static image was possible, the image pick-up of a dynamic image was made difficult from problems, such as an after-image.

[0004] Then, this invention persons have advanced researches and developments of the solid state camera in which the light sensing portion, the circumference circuit, etc. were

formed to the silicon wafer that the problem mentioned above should be solved. Thus, when forming a light sensing portion in a silicon wafer, large area-ization of a light sensing portion is attained by using the silicon wafer of the large area of 8 inches. However, since possibility that the number of the solid state cameras which can be obtained from the silicon wafer of one sheet decreases extremely as it was called one, and a defect pixel existed in a light sensing portion by large area-ization of a light sensing portion also became high, it newly became clear that the yield got worse.

[0005] Moreover, when the shift register which sends out a current signal towards the signal readout circuitry and this signal readout circuitry for reading the current signal outputted from the optoelectric transducer as a circumference circuit was formed on the same wafer, possibility that a defect existed also in this shift register became high, and it also newly became clear that the yield fell further.

[0006] It is made in view of this situation, when forming a light sensing portion and a circumference circuit in the same substrate, lowering of the yield is controlled, and this invention aims at offering the solid state camera in which large-area-izing of a light sensing portion is possible.

[0007]

[Means for Solving the Problem] The light sensing portion of the shape of a rectangle by which the solid state camera concerning this invention is a solid state camera which picturizes the inputted two-dimensional light figure, and the optoelectric transducer which changes an input lightwave signal into a current signal was arranged by two-dimensional, Along with one side of a rectangle-like light sensing portion, only the number corresponding to the number of the optoelectric transducers arranged in the extending direction of one side is formed. The 1st signal readout circuitry which reads the current signal generated in the optoelectric transducer arranged in the direction which intersects perpendicularly with one side of a rectangle-like light sensing portion, The 1st shift register which turns and sends out the current signal generated in the optoelectric transducer arranged in the direction which is established along with one of one side and the two sides which intersect perpendicularly, and intersects perpendicularly with one side of a rectangle-like light sensing portion to a signal readout circuitry, It is prepared along another side of one side and the two sides which intersect perpendicularly, and is characterized by equipping the same substrate with the 2nd shift register which turns and sends out the current signal generated in the optoelectric transducer arranged in the direction which intersects perpendicularly with one side of a rectangle-like light sensing portion to a signal readout circuitry.

[0008] The 1st shift register is prepared along with one of one side of a rectangle-like light sensing portion in which the 1st signal readout circuitry was prepared by meeting to the same substrate in the solid state camera concerning this invention, and the two sides which intersect perpendicularly. The 2nd shift register is prepared along another side of one side of a rectangle-like light sensing portion in which the 1st signal readout circuitry was prepared by meeting, and the two sides which intersect perpendicularly. Since the current signal generated in the optoelectric transducer by which both the 1st shift register and the 2nd shift register were arranged in the direction which intersects perpendicularly with one side of a rectangle-like light sensing portion is turned and sent out to the 1st signal readout circuitry When the 1st shift register has a defect, the current signal generated in the optoelectric transducer with the 2nd shift register is sent out towards the

1st signal readout circuitry, and becomes things. On the other hand, when the 2nd shift register has a defect, the current signal generated in the optoelectric transducer with the 1st shift register is sent out towards the 1st signal readout circuitry, and becomes things. therefore -- the case where either the 1st shift register and the 2nd shift register have a defect -- either the 1st shift register and the 2nd shift register -- it becomes possible to send out the current signal generated in the optoelectric transducer on the other hand, and when a light sensing portion is large-area-ized, lowering of the yield of a solid state camera can be controlled. Moreover, since each is prepared along one side of a rectangle-like light sensing portion in which the 1st signal readout circuitry was prepared by meeting, and the side which intersects perpendicularly, the 1st shift register and the 2nd shift register can constitute a substrate in a compact.

[0009] Moreover, only the number corresponding to the number of the optoelectric transducers arranged in the extending direction of one side is formed along the side which counters one side of a rectangle-like light sensing portion. The same substrate is further equipped with the 2nd signal readout circuitry which reads the current signal generated in the optoelectric transducer arranged in the direction which intersects perpendicularly with one side of a rectangle-like light sensing portion. As for the 1st shift register and the 2nd shift register, it is desirable that it can be sent out even if it turns to any by the side of the 1st signal readout circuitry and the 2nd signal readout circuitry the current signal generated in the optoelectric transducer arranged in the direction which intersects perpendicularly with one side of a rectangle-like light sensing portion. In this case, the side which counters one side of a rectangle-like light sensing portion is met to the same substrate. The 2nd signal readout circuitry of the number corresponding to the number of the optoelectric transducers arranged in the extending direction of one side is prepared. The 1st shift register and the 2nd shift register Since it can send out even if it turns to any by the side of the 1st signal readout circuitry and the 2nd signal readout circuitry the current signal generated in the optoelectric transducer, when the 1st signal readout circuitry has a defect By turning and sending out the current signal generated in the optoelectric transducer with the 1st shift register or the 2nd shift register to the 2nd signal readout-circuitry side, the current signal generated in the optoelectric transducer is read and outputted by the 2nd signal readout circuitry. On the other hand, when the 2nd signal readout circuitry has a defect, by turning and sending out the current signal generated in the optoelectric transducer with the 1st shift register or the 2nd shift register to the 1st signal readout-circuitry side, by the 1st signal readout circuitry, reading appearance of the current signal generated in the optoelectric transducer is carried out, and it is outputted. therefore, even when either the 1st signal readout circuitry and the 2nd signal readout circuitry have a defect The current signal generated in the optoelectric transducer with the 1st shift register or the 2nd shift register is sent out to any of the 1st signal readout circuitry and the 2nd signal readout circuitry, or another side. either this 1st signal readout circuitry and the 2nd signal readout circuitry -- it becomes possible to read the current signal generated in the optoelectric transducer on the other hand, and when a light sensing portion is large-area-ized, lowering of the yield of a solid state camera can be controlled further.

[0010] The optoelectric transducer which the solid state camera concerning this invention is a solid state camera which picturizes the inputted two-dimensional light figure, and changes an input lightwave signal into a current signal, The 1st switching device which

flows out the current signal which the 1st terminal was connected to the signal output terminal of an optoelectric transducer, and was generated in the optoelectric transducer from the 2nd terminal according to the scan signal as 1 set of photo detectors The unit light sensing portion by which only the 1st number is arranged along the 1st direction has the light sensing portion by which only the 2nd number was arranged along the 2nd direction. In one edge of each unit light sensing portion The 1st signal output terminal mutually connected with the 2nd terminal of each 1st switching device electrically is prepared. 2nd number of the 1st signal readout circuitries which reads the current signal which inputted the signal outputted from the 1st signal output terminal of each unit light sensing portion according to the individual, respectively, and was outputted from the unit light sensing portion, So that the current signal generated in each optoelectric transducer may be turned and sent out to the 1st signal output terminal of each unit light sensing portion So that the 1st shift register which outputs a scan signal, and the current signal generated in each optoelectric transducer may be turned and sent out to the 1st signal output terminal of each unit light sensing portion The same substrate is equipped with the 2nd shift register which outputs a scan signal, and the 1st shift register and the 2nd shift register are characterized by being prepared in the location which counters on both sides of a light sensing portion along the 1st direction.

[0011] In the solid state camera concerning this invention, the current signal generated in each optoelectric transducer to the same substrate Since the 1st shift register and the 2nd shift register which output a scan signal are prepared in the location which counters on both sides of a light sensing portion along the 1st direction so that it may send out towards the 1st signal output terminal of each unit light sensing portion When the 1st shift register has a defect, the current signal generated in the optoelectric transducer with the 2nd shift register will be sent out towards the 1st signal output terminal. On the other hand, when the 2nd shift register has a defect, the current signal generated in the optoelectric transducer with the 1st shift register will be sent out towards the 1st signal output terminal. therefore -- the case where either the 1st shift register and the 2nd shift register have a defect -- either the 1st shift register and the 2nd shift register -- it becomes possible to send out the current signal generated in the optoelectric transducer on the other hand, and when a light sensing portion is large-area-ized, lowering of the yield of a solid state camera can be controlled. Moreover, since the 1st shift register and the 2nd shift register are prepared in the location which counters on both sides of a light sensing portion along the 1st direction, they can constitute a substrate in a compact.

[0012] Moreover, the 2nd signal output terminal mutually connected with the 2nd terminal of each 1st switching device electrically is prepared in the other-end section of each unit light sensing portion. The signal outputted from the 2nd signal output terminal of each unit light sensing portion is inputted according to an individual, respectively. The same substrate is further equipped with 2nd number of the 2nd signal readout circuitries which reads the current signal outputted from the unit light sensing portion. The 1st shift register and the 2nd shift register It is desirable to output a scan signal so that it can be sent out, even if it turns to any of the 1st signal output terminal of each unit light sensing portion, and the 2nd signal output terminal the current signal generated in each optoelectric transducer. In this case, the signal outputted from the 2nd signal output terminal of each unit light sensing portion is inputted according to an individual to the same substrate, respectively. 2nd number of the 2nd signal readout circuitries which reads

the current signal outputted from the unit light sensing portion are prepared. The 1st shift register and the 2nd shift register Since it can send out even if it turns to any of each 1st signal output terminal and each 2nd signal output terminal the current signal generated in each optoelectric transducer When the 1st signal readout circuitry has a defect By turning and sending out the current signal generated in the optoelectric transducer with the 1st shift register or the 2nd shift register to each 2nd signal output terminal, by the 2nd signal readout circuitry, reading appearance of the current signal generated in the optoelectric transducer is carried out, and it is outputted. On the other hand, when the 2nd signal readout circuitry has a defect, by turning and sending out the current signal generated in the optoelectric transducer with the 1st shift register or the 2nd shift register to each 1st signal output terminal, by the 1st signal readout circuitry, reading appearance of the current signal generated in the optoelectric transducer is carried out, and it is outputted. therefore, even when either the 1st signal readout circuitry and the 2nd signal readout circuitry have a defect The current signal generated in the optoelectric transducer with the 1st shift register or the 2nd shift register is sent out to any of the 1st signal readout circuitry and the 2nd signal readout circuitry, or another side. either this 1st signal readout circuitry and the 2nd signal readout circuitry -- it becomes possible to read the current signal generated in the optoelectric transducer on the other hand, and when a light sensing portion is large-area-ized, lowering of the yield of a solid state camera can be controlled further.

[0013] Moreover, as for the 1st signal readout circuitry, it is desirable to equip the same substrate with the 1st output selection circuit which has the 1st analog signal readout circuitry which reads the current signal generated in the optoelectric transducer as an analog signal, and the 1st digital signal readout circuitry which changes and reads the output signal from the 1st analog signal readout circuitry to a digital signal, and outputs selectively the output signal from the 1st analog signal readout circuitry or one output signal of the output signals from the 1st digital signal readout circuitry further. Thus, when the 1st signal readout circuitry has the 1st analog signal readout circuitry and the 1st digital signal readout circuitry, and equips the same substrate with the 1st output selection circuit and it chooses the output signal from the 1st digital signal readout circuitry in this 1st output selection circuit, reading appearance of the output signal from the 1st analog signal readout circuitry will be changed and carried out to a digital signal in the 1st digital signal readout circuitry, and it will be outputted from the 1st digital signal readout circuitry. On the other hand, when either of the 1st digital signal readout circuitries has a defect, reading appearance of the current signal which chose the output signal from the 1st analog signal readout circuitry in the 1st output selection circuit, and was generated in the optoelectric transducer will be carried out as an analog signal in the 1st analog signal readout circuitry, and it will be outputted from the 1st analog signal readout circuitry. Therefore, it becomes possible to read the current signal generated by the optoelectric transducer in the 1st analog signal readout circuitry, even when either of the 1st digital signal readout circuitries has a defect, and when a light sensing portion is large-area-ized, lowering of the yield of a solid state camera can be controlled further. Moreover, since it becomes a digital output in reading the current signal generated by the optoelectric transducer in the 1st digital signal readout circuitry, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera of it is attained. Moreover, when reading the

current signal generated by the optoelectric transducer in the 1st analog signal readout circuitry, high-resolution-ization is attained by using an external A/D converter.
[0014] Moreover, the 1st signal readout circuitry has the 1st analog signal readout circuitry which reads the current signal generated in the optoelectric transducer as an analog signal, and, as for the 2nd signal readout circuitry, it is desirable to have the 2nd digital signal readout circuitry which reads the current signal generated in the optoelectric transducer as a digital signal. Thus, when sending out the current signal generated in the optoelectric transducer towards the 2nd digital signal readout-circuitry side when the 1st signal readout circuitry had the 1st analog signal readout circuitry and the 2nd signal readout circuitry had the 2nd digital signal readout circuitry, reading appearance of this current signal will be carried out as a digital signal in the 2nd digital signal readout circuitry. On the other hand, when either of the 2nd digital signal readout circuitries has a defect, this current signal will be read as an analog signal by the 1st analog signal readout circuitry by sending out a current signal towards the 1st analog signal readout-circuitry side. Therefore, it becomes possible to read the current signal generated by the optoelectric transducer in the 1st analog signal readout circuitry, even when either of the 2nd digital signal readout circuitries has a defect, and when a light sensing portion is large-area-ized, lowering of the yield of a solid state camera can be controlled further. Moreover, since it becomes a digital output in reading the current signal generated by the optoelectric transducer in the 2nd digital signal readout circuitry, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera of it is attained. Moreover, when reading the current signal generated by the optoelectric transducer in the 1st analog signal readout circuitry, high-resolution-ization is attained by using an external A/D converter.
[0015] Moreover, the 1st analog signal readout circuitry from which the 1st signal readout circuitry reads the current signal generated in the optoelectric transducer as an analog signal, It has the 1st digital signal readout circuitry which changes and reads the output signal from the 1st analog signal readout circuitry to a digital signal. The 2nd signal readout circuitry It has the 2nd analog signal readout circuitry which reads the current signal generated in the optoelectric transducer as an analog signal. It is desirable to equip the same substrate with the 1st output selection circuit which outputs selectively the output signal from the 1st analog signal readout circuitry or one output signal of the output signals from the 1st digital signal readout circuitry further. Thus, the 1st signal readout circuitry has the 1st analog signal readout circuitry and the 1st digital signal readout circuitry. When the 2nd signal readout circuitry has the 2nd analog signal readout circuitry and equips the same substrate with the 1st output selection circuit In choosing the output signal from the 1st digital signal readout circuitry in this 1st output selection circuit Reading appearance of the output signal from the 1st analog signal readout circuitry will be changed and carried out to a digital signal in the 1st digital signal readout circuitry, and it will be outputted from the 1st digital signal readout circuitry. On the other hand, when either of the 1st digital signal readout circuitries has a defect, reading appearance of the current signal which chose the output signal from the 1st analog signal readout circuitry in the 1st output selection circuit, and was generated in the optoelectric transducer will be carried out as an analog signal in the 1st analog signal readout circuitry, and it will be outputted from the 1st analog signal readout circuitry. Moreover, when the 1st digital signal readout circuitry and the 1st analog signal readout circuitry have a

defect, this current signal will be read as an analog signal by the 2nd analog signal readout circuitry by sending out a current signal towards the 2nd analog signal readout-circuitry side. Therefore, in the 1st digital signal readout circuitry, when the 1st analog signal readout circuitry has a defect, even when the 1st analog signal readout circuitry and the 1st digital signal readout circuitry have a defect, it becomes possible to read the current signal generated by the optoelectric transducer in the 2nd analog signal readout circuitry, and lowering of the yield of a solid state camera can be controlled substantially. Moreover, since it becomes a digital output in reading the current signal generated by the optoelectric transducer in the 1st digital signal readout circuitry, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera of it is attained. Moreover, when reading the current signal generated by the optoelectric transducer in the 1st analog signal readout circuitry or the 2nd analog signal readout circuitry, high-resolution-ization is attained by using an external A/D converter.

[0016] Moreover, as for the 2nd signal readout circuitry, it is desirable to equip the same substrate with the 2nd output selection circuit which has further the 2nd digital signal readout circuitry which changes and reads the output signal from the 2nd analog signal readout circuitry to a digital signal, and outputs selectively the output signal from the 2nd analog signal readout circuitry or one output signal of the output signals from the 2nd digital signal readout circuitry further. Thus, the 1st signal readout circuitry has the 1st analog signal readout circuitry and the 1st digital signal readout circuitry. When the 2nd signal readout circuitry has the 2nd analog signal readout circuitry and the 2nd digital signal readout circuitry and equips the same substrate with the 1st output selection circuit and the 2nd output selection circuit In choosing the output signal from the 1st digital signal readout circuitry in this 1st output selection circuit Reading appearance of the output signal from the 1st analog signal readout circuitry will be changed and carried out to a digital signal in the 1st digital signal readout circuitry, and it will be outputted from the 1st digital signal readout circuitry. On the other hand, when either of the 1st digital signal readout circuitries has a defect, reading appearance of the current signal which chose the output signal from the 1st analog signal readout circuitry in the 1st output selection circuit, and was generated in the optoelectric transducer will be carried out as an analog signal in the 1st analog signal readout circuitry, and it will be outputted from the 1st analog signal readout circuitry. Moreover, when the 1st digital signal readout circuitry and the 1st analog signal readout circuitry have a defect, by choosing the output signal from the 1st digital signal readout circuitry in the 2nd output selection circuit, reading appearance of the output signal from the 2nd analog signal readout circuitry will be changed and carried out to a digital signal in the 2nd digital signal readout circuitry, and it will be outputted from the 2nd digital signal readout circuitry. Moreover, when either of the 2nd digital signal readout circuitries has a defect, reading appearance of the current signal which chose the output signal from the 2nd analog signal readout circuitry in the 2nd output selection circuit, and was generated in the optoelectric transducer will be carried out as an analog signal in the 2nd analog signal readout circuitry, and it will be outputted from the 2nd analog signal readout circuitry. When the 1st analog signal readout circuitry has a defect, therefore, in the 1st digital signal readout circuitry When the 1st analog signal readout circuitry and the 1st digital signal readout circuitry have a defect, in the 2nd digital signal readout circuitry When the 1st analog signal readout

circuitry, the 1st digital signal readout circuitry, and a **** 2 digital-signal readout circuitry have a defect, in the 2nd analog signal readout circuitry It becomes possible to read the current signal generated in the optoelectric transducer, and lowering of the yield of a solid state camera can be controlled substantially. Moreover, since it becomes a digital output in reading the current signal generated by the optoelectric transducer in the 1st digital signal readout circuitry or the 2nd digital signal readout circuitry, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera of it is attained. Moreover, when reading the current signal generated by the optoelectric transducer in the 1st analog signal readout circuitry or the 2nd analog signal readout circuitry, high-resolution-ization is attained by using an external A/D converter.

[0017]

[Embodiment of the Invention] Hereafter, with reference to an accompanying drawing, the suitable operation gestalt of the solid state camera concerning this invention is explained to a detail. In addition, in explanation of a drawing, the same sign is given to the same element, and the overlapping explanation is omitted. Moreover, N is two or more integers, and especially suffix n shall show the integer of the arbitration from 1 to N, unless it shows clearly.

[0018] (The 1st operation gestalt) The 1st operation gestalt of the solid state camera concerning this invention is first explained using drawing 1 and drawing 2 . Drawing 1 is the conceptual diagram showing the outline configuration of the solid state camera concerning the 1st operation gestalt, and drawing 2 is circuitry drawing of the solid state camera concerning the 1st operation gestalt. As the solid state camera 1 concerning the 1st operation gestalt is shown in drawing 1 , it has the substrate 10 formed in the rectangle, and a light sensing portion 20, the 1st analog signal read-out section 30, the 1st digital signal read-out section 40, the 1st shift register 50, and the 2nd shift register 60 are formed in this substrate 10 using the CMOS process etc. The silicon wafer which cut the silicon ingot is used for the substrate 10, and a substrate 10 is formed by cutting this silicon wafer to a rectangle. The silicon wafer of 8 inch phi is used in this operation gestalt.

[0019] The light sensing portion 20 is formed in the abbreviation square configuration where each side was set to 130mm, and 211.1-21N (pixel) .N of each photo detector is formed with 50 micrometer pitch extent of every direction in this. The 1st analog signal read-out section 30 is formed along with 1st side 20a of a light sensing portion 20. The 1st digital signal read-out section 40 is formed along with 2nd side 20b which counters 1st side 20a of a light sensing portion 20. The 1st shift register 50 is formed along with 3rd side 20c which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b. The 2nd shift register 60 is formed along the 20d of the 4th side which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b, and counters 3rd side 20c. The signal output terminals 80 and 90 are respectively connected to the 1st analog signal read-out section 30 and the 1st digital signal read-out section 40.

[0020] As a light sensing portion 20 is shown in drawing 2 , two-dimensional array of the 21n [ of photo detectors ] .n is carried out to the N line xN train. 211.1-21N .N of each photo detector has the photodiode 23 as an optoelectric transducer which changes an input lightwave signal into a current signal, and the 1st switching device 25. It has the

signal input terminal and the signal output terminal, the signal input terminal of the 1st switching device 25 is connected to the signal output terminal of a photodiode 23, and the 1st switching device 25 flows out of a signal output terminal the current signal generated with the photodiode 23 according to the scan signal Sn from the 1st shift register 50 or the 2nd shift register 60. N individual array is carried out along the 1st direction (the 3rd side 20c or the extending direction of the 20d of the 4th side), such 21n [ of photo detectors ] .n gets down, and 21n [ of photo detectors by which N individual array was carried out along this 1st direction ] . 1-21n.N constitutes 22n of unit light sensing portions by connecting electrically the signal output terminal of each 1st switching device 25. N individual array of the 22n of this unit light sensing portion is carried out along the 1st direction and the 2nd direction (direction where the 1st side 20a or 2nd side 20b is prolonged) which intersects perpendicularly.

[0021] The 1st signal output terminal 27 mutually connected with the signal output terminal of each 1st switching device 25 electrically is formed in one edge of 22n of each unit light sensing portion, and the 2nd signal output terminal 29 mutually connected with the signal output terminal of each 1st switching device 25 electrically is respectively formed in the other-end section which is 22n of each unit light sensing portion. Each 1st signal output terminal 27 is connected to the 1st analog signal read-out section 30 through the 2nd switching device 71. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, N individual array of this 2nd switching device 71 is carried out in the 2nd direction. Moreover, each 2nd signal output terminal 29 is connected to the 1st digital signal read-out section 40 through the 3rd switching device 72. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, N individual array of this 3rd switching device 72 is carried out in the 2nd direction. The 2nd switching device 71 and 3rd switching device 72 operate according to the signal from a control circuit (not shown).

[0022] The 1st analog signal read-out section 30 has the 1st analog signal readout circuitry 31, as shown in drawing 2 . N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 1st analog signal readout circuitry 31 is formed in the 2nd direction in the shape of an array. Each 1st analog signal readout circuitry 31 has the integrating circuit 33, the CDS circuit (not shown), etc. The charge sensitive amplifier 35 which an integrating circuit 33 inputs the output signal from 22n (the 1st signal output terminal 27) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 37 by which one terminal was connected to the input terminal of a charge sensitive amplifier 35, and the other-end child was connected to the output terminal of a charge sensitive amplifier 35, One terminal is connected to the input terminal of a charge sensitive amplifier 35, and an other-end child is connected to the output terminal of a charge sensitive amplifier 35. Reset-signal R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 4th switching device 39 which will be in an "OFF" condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 37 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating circuit 33, reset-

signal R comes to operate un-finding the integral, in being significant.
[0023] Reading appearance of the current signal from 22n (the 1st signal output terminal 27) of unit light sensing portions is carried out by the 1st analog signal readout circuitries 31 (an integrating circuit 33, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the signal output terminal 80. The 5th switching device 73 is formed in the latter part (between the signal output terminals 80) of each 1st analog signal readout circuitry 31. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 31, and this 5th switching device 73 operates according to the signal from a control circuit.
[0024] As the 1st digital signal read-out section 40 is shown in drawing 2 , it has the 2nd analog signal read-out section 41 and the 1st digital signal converter 47, and the 2nd analog signal read-out section 41 contains the 2nd analog signal readout circuitry 42. N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 2nd analog signal readout circuitry 42 is formed in the 2nd direction in the shape of an array. Each 2nd analog signal readout circuitry 42 has the integrating circuit 43, the CDS circuit (not shown), etc. The charge sensitive amplifier 44 which an integrating circuit 43 inputs the output signal from 22n (the 2nd signal output terminal 29) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 45 by which one terminal was connected to the input terminal of a charge sensitive amplifier 44, and the other-end child was connected to the output terminal of a charge sensitive amplifier 44, One terminal is connected to the input terminal of a charge sensitive amplifier 44, and an other-end child is connected to the output terminal of a charge sensitive amplifier 44. Reset-signal R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 6th switching device 46 which will be in an "OFF" condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 45 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating circuit 43, reset-signal R comes to operate un-finding the integral, in being significant.
[0025] Reading appearance of the current signal from 22n (the 2nd signal output terminal 29) of unit light sensing portions is carried out by the 2nd analog signal readout circuitries 42 (an integrating circuit 43, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the 1st digital signal converter 47. The 7th switching device 74 is formed between each 2nd analog signal readout circuitry 42 and 1st digital signal converter 47. N individual array is carried out corresponding to the number of the 2nd analog signal readout circuitries 42, and this 7th switching device 74 operates according to the signal from a control circuit.
[0026] The 1st digital signal converter 47 has A/D converter 48, N individual array is carried out corresponding to the number of the 2nd analog signal readout circuitries 42, and this A/D converter 48 is formed in the 2nd direction in the shape of an array. Each A/D converter 48 inputs the analog signal outputted from each 2nd analog signal readout circuitry 42, changes this analog signal into a digital signal, and sends it out towards the signal output terminal 90 through a data bus.
[0027] The 1st shift register 50 outputs the scan signal Sn to each 1st switching device 25,

in order to send out the current signal generated with the photodiode 23 of 21n [ of each photo detector ] .n. As shown in drawing 2 , the 1st shift register 50 is connected to these 1st switching device 25 to the 1st switching device 25 of 211.n-21N [ of photo detectors ] .n arranged in the 2nd direction so that the scan signal Sn may be outputted simultaneously.

[0028] The 2nd shift register 60 also outputs the scan signal Sn to each 1st switching device 25, in order to send out the current signal generated with the photodiode 23 of 21n [ of each photo detector ] .n like the 1st shift register 50. As shown in drawing 2 , the 2nd shift register 60 is connected to these 1st switching device 25 to the 1st switching device 25 of 211.n-21N [ of photo detectors ] .n arranged in the 2nd direction so that the scan signal Sn may be outputted simultaneously.

[0029] Next, actuation of the solid state camera 1 of the 1st operation gestalt is explained. In this solid state camera 1, the light figure which the light the light sensing portion 20 carried out [ light ] incidence forms is inputted, and the charge according to light income is accumulated in the photodiode 23 of a light sensing portion 20. And the amount of charges accumulated in each photodiode 23 is read as follows after progress of a predetermined light-receiving period.

[0030] In the 1st analog signal read-out section 30 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 71 is closed and each 3rd switching device 72 is opened. Moreover, the 4th switching device 39 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 33 as significant, and a capacitative element 37 is initialized.

[0031] Next, the scan signal Sn is made significant to predetermined timing in the 4th switching device 39 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 33 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 31 (the 1st analog signal read-out section 30) by the light-receiving till then through the 2nd switching device 71. And the integrating circuit 33 of the 1st analog signal readout circuitry 31 is accumulated in the capacitative element 37 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 33 becomes large gradually.

[0032] Through a CDS circuit etc., the voltage signal outputted from the integrating circuit 33 is outputted as an analog signal from each 1st analog signal readout circuitry 31 (the 1st analog signal read-out section 30), and ends data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 31, the analog signal is made to output one by one from each 1st analog signal readout circuitry 31, using as significant the signal sent to each 5th switching device 73 one by one, and the scan in the 2nd direction is performed.

[0033] Subsequently, reset-signal R to an integrating circuit 33 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 4th switching device 39 and initializing a

capacitative element 37.
[0034] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the analog signal as image pick-up data is acquired.
[0035] On the other hand, in the 1st digital signal read-out section 40 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 71 is opened and each the 3rd switching device 72 and each 7th switching device 74 are closed. Moreover, the 6th switching device 46 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 43 as significant, and a capacitative element 45 is initialized.
[0036] Next, Sn is made significant to predetermined timing in the 6th switching device 46 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 43 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 2nd analog signal readout circuitry 42 (the 1st digital signal read-out section 40) by the light-receiving till then through the 3rd switching device 72. And the integrating circuit 43 of the 2nd analog signal readout circuitry 42 is accumulated in the capacitative element 45 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 43 becomes large gradually.
[0037] The outputted voltage signal is outputted to each A/D converter 48 from each 2nd analog signal readout circuitry 42 as an analog signal through a CDS circuit etc. from an integrating circuit 43. In A/D converter 48, the analog signal outputted from the 2nd analog signal readout circuitry 42 is changed into a digital signal, this digital signal is outputted to a data bus, and data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction is ended. In case a digital signal is outputted from each A/D converter 48, based on the signal from a control circuit, each A/D converter 48 outputs a digital signal one by one to predetermined timing, and is performing the scan in the 2nd direction. In addition, in case an analog signal is outputted from each 2nd analog signal readout circuitry 42, it is also possible to perform a scan in the 2nd direction by making an analog signal output one by one from each 2nd analog signal readout circuitry 42, using as significant the signal sent to each 7th switching device 74 one by one.
[0038] Subsequently, reset-signal R to an integrating circuit 33 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 6th switching device 46 and initializing a capacitative element 45.
[0039] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the digital signal as image pick-up data is acquired.
[0040] As mentioned above, according to the solid state camera 1 of the 1st operation gestalt, the 1st shift register 50 is formed along with 3rd side 20c of the light sensing portion 20 by which two-dimensional array of the 21n [ of photo detectors ] .n was carried out to the N line xN train, and the 2nd shift register 60 is formed along the 20d of the 4th side of a light sensing portion 20. Moreover, this 1st shift register 50 and 2nd shift register 60 Since the scan signal Sn is outputted so that it can be sent out, even if it turns to any of the 1st signal output terminal 27 of 22n of each unit light sensing portion, and

the 2nd signal output terminal 29 the current signal generated with each photodiode 23 When closing and each 3rd switching device 72 are opened, both the 1st shift register 50 and the 2nd shift register 60 each 2nd switching device 71 The current signal generated in 22n (photodiode 23 arranged in the 1st direction) of each unit light sensing portion is turned and sent out to the 1st analog signal read-out section 30. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 1st analog signal read-out section 30, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 1st analog signal read-out section 30, and becomes things.

[0041] Similarly, the current signal with which both the 1st shift register 50 and the 2nd shift register 60 generated each 2nd switching device 71 in 22n of each unit light sensing portion when an aperture and each 3rd switching device 72 were closed is turned and sent out to the 1st digital signal read-out section 40. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 1st digital signal read-out section 40, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 1st digital signal read-out section 40, and becomes things.

[0042] therefore, even when either the 1st shift register 50 and the 2nd shift register 60 have a defect The 1st shift register 50 and the 2nd shift register 60 either on the other hand It becomes possible to send out the current signal generated in 22n of each unit light sensing portion towards the 1st analog signal read-out section 30 or the 1st digital signal read-out section 40. A light sensing portion 20 is large-area-ized, and when the circumference circuit of the 1st analog signal read-out section 30, the 1st digital signal read-out section 40, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 10, lowering of the yield of a solid state camera 1 can be controlled.

[0043] Moreover, the 1st shift register 50 and the 2nd shift register 60 will be formed in the location whose light sensing portion 20 was pinched and which counters, and can constitute a substrate 10 from forming the 1st shift register 50 along with 3rd side 20c, and forming the 2nd shift register 60 along the 20d of the 4th side in a compact.

[0044] Moreover, the 1st analog signal read-out section 30 is formed along with 1st side 20a of the light sensing portion 20 by which two-dimensional array of the 21n [ of photo detectors ] .n was carried out to the N line xN train, and the 1st digital signal read-out section 40 is formed along with 2nd side 20b which counters 1st side 20a of a light sensing portion 20. Moreover, the 1st analog signal read-out section 30 inputs the signal outputted from the 1st signal output terminal 27 of 22n of each unit light sensing portion according to an individual, respectively. It has the 1st analog signal readout circuitry 31 of N individual which reads the current signal outputted from 22n of unit light sensing portions as an analog signal. The 1st digital signal read-out section 40 The 2nd analog signal readout circuitry 42 of N individual which reads the current signal which inputted the signal outputted from the 2nd signal output terminal 29 of 22n of each unit light sensing portion according to the individual, respectively, and was outputted from 22n of unit light sensing portions as an analog signal, It has A/D converter 48 of N individual

which changes into a digital signal the analog signal outputted from each 2nd analog signal readout circuitry 42. When an aperture and each 3rd switching device 72 are closed for each 2nd switching device 71, the 1st shift register 50 or the 2nd shift register 60 will send out a current signal towards the 2nd signal output terminal 29 side, and reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as a digital signal in each 1st digital signal read-out section 40.

[0045] On the other hand, when either of A/D converters 48 of the 1st digital signal read-out section 40, for example, N individual, has a defect By turning each 2nd switching device 71 to closing, turning each 3rd switching device 72 to the 1st signal output terminal 27 side with an aperture, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as an analog signal by each 1st analog signal readout circuitry 31 (the 1st analog signal read-out section 30).

[0046] therefore, even when the 1st digital signal read-out section 40 side has a defect It becomes possible to read the current signal generated with the photodiode 23 in the 1st analog signal read-out section 30 side. A light sensing portion 20 is large-area-ized. When the circumference circuit of the 1st analog signal read-out section 30, the 1st digital signal read-out section 40, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 10, lowering of the yield of a solid state camera 1 can be controlled further.

[0047] Moreover, since it becomes a digital output in reading the current signal generated with the photodiode 23 in the 1st digital signal read-out section 40 side, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera 1 of it is attained. Moreover, since it is prepared in the same substrate 10, although there is a limitation (for example, resolution of about 11 bits) in making it high from a tooth-space-problem, when reading the current signal generated with the photodiode 23 in the 1st analog signal read-out section 30 side, the resolution in the 1st digital signal read-out section 40 is using an external A/D converter, and high-resolution-ization (for example, resolution of about 16 bits) of it is attained.

[0048] Moreover, the 1st analog signal read-out section 30 and the 1st digital signal read-out section 40 will be formed in the location whose light sensing portion 20 was pinched and which counters, and can constitute a substrate 10 from forming the 1st analog signal read-out section 30 along with 1st side 20a, and forming the 1st digital signal read-out section 40 along with 2nd side 20b in a compact further.

[0049] (The 2nd operation gestalt) Next, the 2nd operation gestalt of the solid state camera concerning this invention is explained using drawing 3 and drawing 4 . Drawing 3 is the conceptual diagram showing the outline configuration of the solid state camera concerning the 2nd operation gestalt, and drawing 3 is circuitry drawing of the solid state camera concerning the 2nd operation gestalt. The solid state camera 101 concerning the 2nd operation gestalt is different in that it has the two analog signal read-out sections compared with the solid state camera 1 concerning the 1st operation gestalt.

[0050] As the solid state camera 101 concerning the 2nd operation gestalt is shown in drawing 3 , it has the substrate 110 formed in the rectangle, and a light sensing portion 20,

the 1st analog signal read-out section 130, the 1st digital signal read-out section 140, the 2nd analog signal read-out section 150, the 1st shift register 50, and the 2nd shift register 60 are formed in this substrate 110 using the CMOS process etc. The silicon wafer of 8 inch phi is used for the substrate 110 like the 1st operation gestalt.

[0051] The light sensing portion 20 is formed in the abbreviation square configuration where each side was set to 130mm, and 211.1-21N (pixel) .N of each photo detector is formed with 50 micrometer pitch extent of every direction in this. The 1st analog signal read-out section 130 is formed along with 1st side 20a of a light sensing portion 20. The 1st digital signal read-out section 140 is formed along with the 1st analog signal read-out section 130 prepared along with 1st side 20a of a light sensing portion 20. The 2nd analog signal read-out section 150 is formed along with 2nd side 20b which counters 1st side 20a of a light sensing portion 20. The 1st shift register 50 is formed along with 3rd side 20c which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b. The 2nd shift register 60 is formed along the 20d of the 4th side which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b, and counters 3rd side 20c. The signal output terminal 191,192,193 is respectively connected to the 1st analog signal read-out section 130, the 1st digital signal read-out section 140, and the 2nd analog signal read-out section 150.

[0052] As a light sensing portion 20 is shown in drawing 4 , two-dimensional array of the 21n [ of photo detectors ] .n is carried out to the N line xN train. 211.1-21N .N of each photo detector has the photodiode 23 as an optoelectric transducer which changes an input lightwave signal into a current signal, and the 1st switching device 25. It has the signal input terminal and the signal output terminal, the signal input terminal of the 1st switching device 25 is connected to the signal output terminal of a photodiode 23, and the 1st switching device 25 flows out of a signal output terminal the current signal generated with the photodiode 23 according to the scan signal Sn from the 1st shift register 50 or the 2nd shift register 60. N individual array is carried out along the 1st direction (the 3rd side 20c or the extending direction of the 20d of the 4th side), such 21n [ of photo detectors ] .n gets down, and 21n [ of photo detectors by which N individual array was carried out along this 1st direction ] . 1-21n.N constitutes 22n of unit light sensing portions by connecting electrically the signal output terminal of each 1st switching device 25. N individual array of the 22n of this unit light sensing portion is carried out along the 1st direction and the 2nd direction (direction where the 1st side 20a or 2nd side 20b is prolonged) which intersects perpendicularly.

[0053] The 1st signal output terminal 27 mutually connected with the signal output terminal of each 1st switching device 25 electrically is formed in one edge of 22n of each unit light sensing portion, and the 2nd signal output terminal 29 mutually connected with the signal output terminal of each 1st switching device 25 electrically is respectively formed in the other-end section which is 22n of each unit light sensing portion. Each 1st signal output terminal 27 is connected to the 1st analog signal read-out section 130 through the 2nd switching device 181. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, N individual array of this 2nd switching device 181 is carried out in the 2nd direction. Moreover, each 2nd signal output terminal 29 is connected to the 2nd analog signal read-out section 150 through the 3rd switching device 182. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing

portions, N individual array of this 3rd switching device 182 is carried out in the 2nd direction. The 2nd switching device 181 and 3rd switching device 182 operate according to the signal from a control circuit (not shown).
[0054] The 1st analog signal read-out section 130 has the 1st analog signal readout circuitry 131, as shown in drawing 4 . N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 1st analog signal readout circuitry 131 is formed in the 2nd direction in the shape of an array. Each 1st analog signal readout circuitry 131 has the integrating circuit 133, the CDS circuit (not shown), etc. The charge sensitive amplifier 135 which an integrating circuit 133 inputs the output signal from 22n (the 1st signal output terminal 27) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 137 by which one terminal was connected to the input terminal of a charge sensitive amplifier 135, and the other-end child was connected to the output terminal of a charge sensitive amplifier 135, One terminal is connected to the input terminal of a charge sensitive amplifier 135, and an other-end child is connected to the output terminal of a charge sensitive amplifier 135. Reset-signal R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 4th switching device 139 which will be in an "OFF" condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 137 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating circuit 133, reset-signal R comes to operate un-finding the integral, in being significant.
[0055] Reading appearance of the current signal from 22n (the 1st signal output terminal 27) of unit light sensing portions is carried out by the 1st analog signal readout circuitries 131 (an integrating circuit 133, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the signal output terminal 191. The 5th switching device 183 is formed in the latter part (between the signal output terminals 191) of each 1st analog signal readout circuitry 131. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 131, and this 5th switching device 183 operates according to the signal from a control circuit.
[0056] Moreover, the analog signal in which reading appearance was carried out by the 1st analog signal readout circuitry 131 is sent out even if it turns to the 1st digital signal read-out section 140. The 6th switching device 184 is formed between each 1st analog signal readout circuitry 131 and the 1st digital signal read-out section 140. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 131, and this 6th switching device 184 operates according to the signal from a control circuit. Here, the 5th switching device 183 and 6th switching device 184 constitute the 1st output selection circuit in each claim.
[0057] The 1st digital signal read-out section 140 has A/D converter 141, N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 131, and this A/D converter 141 is formed in the 2nd direction in the shape of an array. Each A/D converter 141 inputs the analog signal outputted from each 1st analog signal readout circuitry 131, changes this analog signal into a digital signal, and sends it out towards the signal output terminal 192 through a data bus.
[0058] The 2nd analog signal read-out section 150 has the 2nd analog signal readout

circuitry 151, as shown in drawing 4 . N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 2nd analog signal readout circuitry 151 is formed in the 2nd direction in the shape of an array. Each 2nd analog signal readout circuitry 151 has the integrating circuit 153, the CDS circuit (not shown), etc. The charge sensitive amplifier 155 which an integrating circuit 153 inputs the output signal from 22n (the 2nd signal output terminal 29) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 157 by which one terminal was connected to the input terminal of a charge sensitive amplifier 155, and the other-end child was connected to the output terminal of a charge sensitive amplifier 155, One terminal is connected to the input terminal of a charge sensitive amplifier 155, and an other-end child is connected to the output terminal of a charge sensitive amplifier 155. Reset-signal R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 7th switching device 159 which will be in an "OFF" condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 157 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating circuit 153, reset-signal R comes to operate un-finding the integral, in being significant.
[0059] Reading appearance of the current signal from 22n (the 2nd signal output terminal 29) of unit light sensing portions is carried out by the 2nd analog signal readout circuitries 151 (an integrating circuit 153, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the signal output terminal 193. The 8th switching device 185 is formed in the latter part (between the signal output terminals 193) of each 2nd analog signal readout circuitry 151. N individual array is carried out corresponding to the number of the 2nd analog signal readout circuitries 151, and this 8th switching device 185 operates according to the signal from a control circuit.
[0060] Next, actuation of the solid state camera 101 of the 2nd operation gestalt is explained. In this solid state camera 101, the light figure which the light the light sensing portion 20 carried out [ light ] incidence forms is inputted, and the charge according to light income is accumulated in the photodiode 23 of a light sensing portion 20. And the amount of charges accumulated in each photodiode 23 is read as follows after progress of a predetermined light-receiving period.
[0061] In the 1st analog signal read-out section 130 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 181 is closed, each 3rd switching device 182 is opened, each 5th switching device 183 is closed and each 6th switching device 184 is opened. Moreover, the 4th switching device 139 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 133 as significant, and a capacitative element 137 is initialized.
[0062] Next, the scan signal Sn is made significant to predetermined timing in the 4th switching device 139 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 133 as un-significant. The scan signal Sn which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the

charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 131 (the 1st analog signal read-out section 130) by the light-receiving till then through the 2nd switching device 181. And the integrating circuit 133 of the 1st analog signal readout circuitry 131 is accumulated in the capacitative element 137 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 133 becomes large gradually.
[0063] Through a CDS circuit etc., the voltage signal outputted from the integrating circuit 133 is outputted as an analog signal from each 1st analog signal readout circuitry 131 (the 1st analog signal read-out section 130), and ends data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction. Since each 6th switching device 184 is opened, the analog signal outputted from the 1st analog signal readout circuitry 131 (the 1st analog signal read-out section 130) is not sent to the 1st digital signal read-out section 140. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 131, the analog signal is made to output one by one from each 1st analog signal readout circuitry 131, using as significant the signal sent to each 5th switching device 183 one by one, and the scan in the 2nd direction is performed.
[0064] Subsequently, reset-signal R to an integrating circuit 133 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 4th switching device 139 and initializing a capacitative element 137.
[0065] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the analog signal as image pick-up data is acquired.
[0066] On the other hand, in the 1st digital signal read-out section 140 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 181 is closed, each 3rd switching device 182 is opened, each 5th switching device 183 is opened, and each 6th switching device 184 is closed. Moreover, the 4th switching device 139 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 133 as significant, and a capacitative element 137 is initialized.
[0067] Next, the scan signal Sn is made significant to predetermined timing in the 4th switching device 139 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 133 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 131 by the light-receiving till then through the 2nd switching device 181. And the integrating circuit 133 of the 1st analog signal readout circuitry 131 is accumulated in the capacitative element 137 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 133 becomes large gradually.
[0068] The outputted voltage signal is outputted to each A/D converter 141 (the 1st digital signal read-out section 140) from each 1st analog signal readout circuitry 131 as an analog signal through a CDS circuit etc. from an integrating circuit 133. In A/D converter 141, the analog signal outputted from the 1st analog signal readout circuitry 131 is changed into a digital signal, this digital signal is outputted to a data bus from each

A/D converter 141 (the 1st digital signal read-out section 140), and data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction is ended. In case a digital signal is outputted from each A/D converter 141, based on the signal from a control circuit, each A/D converter 141 outputs a digital signal one by one to predetermined timing, and is performing the scan in the 2nd direction. Since each 5th switching device 183 is opened, the analog signal outputted from the 1st analog signal readout circuitry 131 (the 1st analog signal read-out section 130) is not sent to the signal output terminal 191. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 131, it is also possible to perform a scan in the 2nd direction by making an analog signal output one by one from each 1st analog signal readout circuitry 131, using as significant the signal sent to each 6th switching device 184 one by one.

[0069] Subsequently, reset-signal R to an integrating circuit 133 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 4th switching device 139 and initializing a capacitative element 137.

[0070] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the digital signal as image pick-up data is acquired.

[0071] In the 2nd analog signal read-out section 150 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 181 is opened and each 3rd switching device 182 is closed. Moreover, the 7th switching device is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 153 as significant, and a capacitative element 157 is initialized.

[0072] Next, the scan signal Sn is made significant to predetermined timing in the 7th switching device 159 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 153 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 2nd analog signal readout circuitry 151 (the 2nd analog signal read-out section 150) by the light-receiving till then through the 3rd switching device 182. And the integrating circuit 153 of the 2nd analog signal readout circuitry 151 is accumulated in the capacitative element 157 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 153 becomes large gradually.

[0073] Through a CDS circuit etc., the voltage signal outputted from the integrating circuit 153 is outputted as an analog signal from each 2nd analog signal readout circuitry 151 (the 2nd analog signal read-out section 150), and ends data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction. In addition, in case an analog signal is outputted from each 2nd analog signal readout circuitry 151, the analog signal is made to output one by one from each 2nd analog signal readout circuitry 151, using as significant the signal sent to each 8th switching device 185 one by one, and the scan in the 2nd direction is performed.

[0074] Subsequently, reset-signal R to an integrating circuit 153 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 7th switching device 159 and initializing a

capacitative element 157.
[0075] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the analog signal as image pick-up data is acquired.
[0076] As mentioned above, according to the solid state camera 101 of the 2nd operation gestalt, the 1st shift register 50 is formed along with 3rd side 20c of the light sensing portion 20 by which two-dimensional array of the 21n [ of photo detectors ] .n was carried out to the N line xN train, and the 2nd shift register 60 is formed along the 20d of the 4th side of a light sensing portion 20. Moreover, this 1st shift register 50 and 2nd shift register 60 Since the scan signal Sn is outputted so that it can be sent out, even if it turns to any of the 1st signal output terminal 27 of 22n of each unit light sensing portion, and the 2nd signal output terminal 29 the current signal generated with each photodiode 23 When closing and each 3rd switching device 182 are opened, both the 1st shift register 50 and the 2nd shift register 60 each 2nd switching device 181 The current signal generated in 22n (photodiode 23 arranged in the 1st direction) of each unit light sensing portion is turned and sent out to the 1st analog signal read-out section 130. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 1st analog signal read-out section 130, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 1st analog signal read-out section 130, and becomes things.
[0077] Similarly, the current signal with which both the 1st shift register 50 and the 2nd shift register 60 generated each 2nd switching device 181 in 22n of each unit light sensing portion when an aperture and each 3rd switching device 182 were closed is turned and sent out to the 2nd analog signal read-out section 150. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 2nd analog signal read-out section 150, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 2nd analog signal read-out section 150, and becomes things.
[0078] therefore, even when either the 1st shift register 50 and the 2nd shift register 60 have a defect The 1st shift register 50 and the 2nd shift register 60 either on the other hand It becomes possible to send out the current signal generated in 22n of each unit light sensing portion towards the 1st analog signal read-out section 130 or the 2nd analog signal read-out section 150. A light sensing portion 20 is large-area-ized. [ when the circumference circuit of the 1st analog signal read-out section 130, the 1st digital signal read-out section 140, the 2nd analog signal read-out section 150, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 110 ] Lowering of the yield of ********** 1 can be controlled.
[0079] Moreover, the 1st shift register 50 and the 2nd shift register 60 will be formed in the location whose light sensing portion 20 was pinched and which counters, and can constitute a substrate 110 from forming the 1st shift register 50 along with 3rd side 20c, and forming the 2nd shift register 60 along the 20d of the 4th side in a compact.
[0080] Moreover, the 1st analog signal read-out section 130 is formed along with 1st side 20a of a light sensing portion 20, the 1st digital signal read-out section 140 is formed

along with the 1st analog signal read-out section 130, and the 2nd analog signal read-out section 150 is formed along with 2nd side 20b which counters 1st side 20a of a light sensing portion 20. The 1st analog signal read-out section 130 inputs the signal outputted from the 1st signal output terminal 27 of 22n of each unit light sensing portion according to an individual, respectively. It has the 1st analog signal readout circuitry 131 of N individual which reads the current signal outputted from 22n of unit light sensing portions as an analog signal. The 1st digital signal read-out section 140 It has A/D converter 141 of N individual which changes into a digital signal the analog signal outputted from each 1st analog signal readout circuitry 131. The 2nd analog signal read-out section 150 The signal outputted from the 2nd signal output terminal 29 of 22n of each unit light sensing portion is inputted according to an individual, respectively, and it has the 2nd analog signal readout circuitry 151 of N individual which reads the current signal outputted from 22n of unit light sensing portions as an analog signal. When closing and each 3rd switching device 182 are closed for each 2nd switching device 181 and an aperture and each 6th switching device 184 are closed for an aperture and each 5th switching device 183 The 1st shift register 50 or the 2nd shift register 60 will send out a current signal towards the 1st signal output terminal 27 side. Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as a digital signal in each 1st digital signal read-out section 140.

[0081] On the other hand, when either of A/D converters 141 of the 1st digital signal read-out section 140, for example, N individual, has a defect Closing and each 3rd switching device 182 for each 2nd switching device 181 An aperture, By turning each 5th switching device 183 to closing, turning each 6th switching device 184 to the 1st signal output terminal 27 side with an aperture, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as an analog signal by each 1st analog signal readout circuitry 131 (the 1st analog signal read-out section 130).

[0082] furthermore, when the 1st digital signal read-out section 140 and the 1st analog signal read-out section 130 have a defect By turning each 2nd switching device 181 to an aperture, turning each 3rd switching device 182 to the 2nd signal output terminal 29 side with closing, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as an analog signal by each 2nd analog signal readout circuitry 151 (the 2nd analog signal read-out section 150).

[0083] therefore, when the 1st digital signal read-out section 140 side has a defect It becomes possible to read the current signal generated with the photodiode 23 in the 1st analog signal read-out section 130 side. moreover, even when the 1st digital signal read-out section 140 and the 1st analog signal read-out section 130 have a defect It becomes possible to read the current signal generated with the photodiode 23 in the 2nd analog signal read-out section 150 side. A light sensing portion 20 is large-area-ized. [ when the circumference circuit of the 1st analog signal read-out section 130, the 1st digital signal read-out section 140, the 2nd analog signal read-out section 150, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 110 ] Lowering of the yield of ********** 101 can be controlled further.

[0084] Moreover, since it becomes a digital output in reading the current signal generated

with the photodiode 23 in the 1st digital signal read-out section 140 side, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera 101 of it is attained. Moreover, the resolution in the 1st digital signal read-out section 140 From a tooth-space-problem to make it high, since it is prepared in the same substrate 110 A limitation Although there is (for example, resolution of about 11 bits), in reading the current signal generated with the photodiode 23 in the 1st analog signal read-out section 130 or 2nd analog signal read-out section 150 side By using an external A/D converter, high-resolution-ization (for example, resolution of about 16 bits) is attained.

[0085] Moreover, the 1st analog signal read-out section 130 (the 1st digital signal read-out section 140) and the 1st analog signal read-out section 130 will be formed in the location whose light sensing portion 20 was pinched and which counters, and can constitute a substrate 110 from forming the 1st analog signal read-out section 130 (the 1st digital signal read-out section 140) along with 1st side 20a, and forming the 2nd analog signal read-out section 150 along with 2nd side 20b in a compact further.

[0086] (The 3rd operation gestalt) Next, the 3rd operation gestalt of the solid state camera concerning this invention is explained using drawing 5 and drawing 6 . Drawing 5 is the conceptual diagram showing the outline configuration of the solid state camera concerning the 3rd operation gestalt, and drawing 6 is circuitry drawing of the solid state camera concerning the 3rd operation gestalt. The solid state camera 201 concerning the 3rd operation gestalt is different in that it has the two digital signal read-out sections compared with the solid state camera 101 concerning the 2nd operation gestalt.

[0087] As the solid state camera 201 concerning the 3rd operation gestalt is shown in drawing 5 , it has the substrate 210 formed in the rectangle, and a light sensing portion 20, the 1st analog signal read-out section 230, the 1st digital signal read-out section 240, the 2nd analog signal read-out section 250, the 2nd digital signal read-out section 260, the 1st shift register 50, and the 2nd shift register 60 are formed in this substrate 210 using the CMOS process etc. The silicon wafer of 8 inch phi is used for the substrate 210 like the 1st operation gestalt and the 2nd operation gestalt.

[0088] The light sensing portion 20 is formed in the abbreviation square configuration where each side was set to 130mm, and 211.1-21N (pixel) .N of each photo detector is formed with 50 micrometer pitch extent of every direction in this. The 1st analog signal read-out section 230 is formed along with 1st side 20a of a light sensing portion 20. The 1st digital signal read-out section 240 is formed along with the 1st analog signal read-out section 230 prepared along with 1st side 20a of a light sensing portion 20. The 2nd analog signal read-out section 250 is formed along with 2nd side 20b which counters 1st side 20a of a light sensing portion 20. The 2nd digital signal read-out section 260 is formed along with the 2nd analog signal read-out section 250 prepared along with 2nd side 20b of a light sensing portion 20. The 1st shift register 50 is formed along with 3rd side 20c which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b. The 2nd shift register 60 is formed along the 20d of the 4th side which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b, and counters 3rd side 20c. The signal output terminal 291,292,293,294 is respectively connected to the 1st analog signal read-out section 230, the 1st digital signal read-out section 240, the 2nd analog signal read-out section 250, and the 2nd digital signal read-out section 260.

[0089] As a light sensing portion 20 is shown in drawing 6 , two-dimensional array of the 21n [ of photo detectors ] .n is carried out to the N line xN train. 211.1-21N .N of each photo detector has the photodiode 23 as an optoelectric transducer which changes an input lightwave signal into a current signal, and the 1st switching device 25. It has the signal input terminal and the signal output terminal, the signal input terminal of the 1st switching device 25 is connected to the signal output terminal of a photodiode 23, and the 1st switching device 25 flows out of a signal output terminal the current signal generated with the photodiode 23 according to the scan signal Sn from the 1st shift register 50 or the 2nd shift register 60. N individual array is carried out along the 1st direction (the 3rd side 20c or the extending direction of the 20d of the 4th side), such 21n [ of photo detectors ] .n gets down, and 21n [ of photo detectors by which N individual array was carried out along this 1st direction ] . 1-21n.N constitutes 22n of unit light sensing portions by connecting electrically the signal output terminal of each 1st switching device 25. N individual array of the 22n of this unit light sensing portion is carried out along the 1st direction and the 2nd direction (direction where the 1st side 20a or 2nd side 20b is prolonged) which intersects perpendicularly.

[0090] The 1st signal output terminal 27 mutually connected with the signal output terminal of each 1st switching device 25 electrically is formed in one edge of 22n of each unit light sensing portion, and the 2nd signal output terminal 29 mutually connected with the signal output terminal of each 1st switching device 25 electrically is respectively formed in the other-end section which is 22n of each unit light sensing portion. Each 1st signal output terminal 27 is connected to the 1st analog signal read-out section 230 through the 2nd switching device 281. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, N individual array of this 2nd switching device 281 is carried out in the 2nd direction. Moreover, each 2nd signal output terminal 29 is connected to the 2nd analog signal read-out section 250 through the 3rd switching device 282. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, N individual array of this 3rd switching device 282 is carried out in the 2nd direction. The 2nd switching device 281 and 3rd switching device 282 operate according to the signal from a control circuit (not shown).

[0091] The 1st analog signal read-out section 230 has the 1st analog signal readout circuitry 231, as shown in drawing 6 . N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 1st analog signal readout circuitry 231 is formed in the 2nd direction in the shape of an array. Each 1st analog signal readout circuitry 231 has the integrating circuit 233, the CDS circuit (not shown), etc. The charge sensitive amplifier 237 which an integrating circuit 233 inputs the output signal from 22n (the 1st signal output terminal 27) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 237 by which one terminal was connected to the input terminal of a charge sensitive amplifier 237, and the other-end child was connected to the output terminal of a charge sensitive amplifier 237, One terminal is connected to the input terminal of a charge sensitive amplifier 237, and an other-end child is connected to the output terminal of a charge sensitive amplifier 237. Reset-signal R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 4th switching device 239 which will be in an "OFF"

condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 237 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating circuit 233, reset-signal R comes to operate un-finding the integral, in being significant.
[0092] Reading appearance of the current signal from 22n (the 1st signal output terminal 27) of unit light sensing portions is carried out by the 1st analog signal readout circuitries 231 (an integrating circuit 233, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the signal output terminal 291. The 5th switching device 283 is formed in the latter part (between the signal output terminals 291) of each 1st analog signal readout circuitry 231. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 231, and this 5th switching device 283 operates according to the signal from a control circuit.
[0093] Moreover, the analog signal in which reading appearance was carried out by the 1st analog signal readout circuitry 231 is sent out even if it turns to the 1st digital signal read-out section 240. The 6th switching device 284 is formed between each 1st analog signal readout circuitry 231 and the 1st digital signal read-out section 240. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 231, and this 6th switching device 284 operates according to the signal from a control circuit. Here, the 5th switching device 283 and 6th switching device 284 constitute the 1st output selection circuit in each claim.
[0094] The 1st digital signal read-out section 240 has A/D converter 241, N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 231, and this A/D converter 241 is formed in the 2nd direction in the shape of an array. Each A/D converter 241 inputs the analog signal outputted from each 1st analog signal readout circuitry 231, changes this analog signal into a digital signal, and sends it out towards the signal output terminal 292 through a data bus.
[0095] The 2nd analog signal read-out section 250 has the 2nd analog signal readout circuitry 251, as shown in drawing 6 . N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 2nd analog signal readout circuitry 251 is formed in the 2nd direction in the shape of an array. Each 2nd analog signal readout circuitry 251 has the integrating circuit 253, the CDS circuit (not shown), etc. The charge sensitive amplifier 257 which an integrating circuit 253 inputs the output signal from 22n (the 2nd signal output terminal 29) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 257 by which one terminal was connected to the input terminal of a charge sensitive amplifier 257, and the other-end child was connected to the output terminal of a charge sensitive amplifier 257, One terminal is connected to the input terminal of a charge sensitive amplifier 257, and an other-end child is connected to the output terminal of a charge sensitive amplifier 257. Reset-signal R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 7th switching device 259 which will be in an "OFF" condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 257 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating

circuit 253, reset-signal R comes to operate un-finding the integral, in being significant.
[0096] Reading appearance of the current signal from 22n (the 2nd signal output terminal 29) of unit light sensing portions is carried out by the 2nd analog signal readout circuitries 251 (an integrating circuit 253, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the signal output terminal 293. The 8th switching device 285 is formed in the latter part (between the signal output terminals 293) of each 2nd analog signal readout circuitry 251. N individual array is carried out corresponding to the number of the 2nd analog signal readout circuitries 251, and this 8th switching device 285 operates according to the signal from a control circuit.
[0097] Moreover, the analog signal in which reading appearance was carried out by the 2nd analog signal readout circuitry 251 is sent out even if it turns to the 2nd digital signal read-out section 260. The 9th switching device 286 is formed between each 2nd analog signal readout circuitry 251 and the 2nd digital signal read-out section 260. N individual array is carried out corresponding to the number of the 2nd analog signal readout circuitries 251, and this 9th switching device 286 operates according to the signal from a control circuit. Here, the 8th switching device 285 and 9th switching device 286 constitute the 2nd output selection circuit in each claim.
[0098] The 2nd digital signal read-out section 260 has A/D converter 261, N individual array is carried out corresponding to the number of the 2nd analog signal readout circuitries 251, and this A/D converter 261 is formed in the 2nd direction in the shape of an array. Each A/D converter 261 inputs the analog signal outputted from each 2nd analog signal readout circuitry 251, changes this analog signal into a digital signal, and sends it out towards the signal output terminal 294 through a data bus.
[0099] Next, actuation of the solid state camera 201 of the 3rd operation gestalt is explained. In this solid state camera 201, the light figure which the light the light sensing portion 20 carried out [ light ] incidence forms is inputted, and the charge according to light income is accumulated in the photodiode 23 of a light sensing portion 20. And the amount of charges accumulated in each photodiode 23 is read as follows after progress of a predetermined light-receiving period.
[0100] In the 1st analog signal read-out section 230 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 281 is closed, each 3rd switching device 282 is opened, each 5th switching device 283 is closed and each 6th switching device 284 is opened. Moreover, the 4th switching device 239 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 233 as significant, and a capacitative element 237 is initialized.
[0101] Next, the scan signal Sn is made significant to predetermined timing in the 4th switching device 239 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 233 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 231 (the 1st analog signal read-out section 230) by the light-receiving till then through the 2nd switching device 281. And the integrating circuit 233 of the 1st analog signal readout circuitry 231 is accumulated in

the capacitative element 237 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 233 becomes large gradually.
[0102] Through a CDS circuit etc., the voltage signal outputted from the integrating circuit 233 is outputted as an analog signal from each 1st analog signal readout circuitry 231 (the 1st analog signal read-out section 230), and ends data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction. Since each 6th switching device 284 is opened, the analog signal outputted from the 1st analog signal readout circuitry 231 (the 1st analog signal read-out section 230) is not sent to the 1st digital signal read-out section 240. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 231, the analog signal is made to output one by one from each 1st analog signal readout circuitry 231, using as significant the signal sent to each 5th switching device 283 one by one, and the scan in the 2nd direction is performed.
[0103] Subsequently, reset-signal R to an integrating circuit 233 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 4th switching device 239 and initializing a capacitative element 237.
[0104] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the analog signal as image pick-up data is acquired.
[0105] On the other hand, in the 1st digital signal read-out section 240 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 281 is closed, each 3rd switching device 282 is opened, each 5th switching device 283 is opened, and each 6th switching device 284 is closed. Moreover, the 4th switching device 239 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 233 as significant, and a capacitative element 237 is initialized.
[0106] Next, the scan signal Sn is made significant to predetermined timing in the 4th switching device 239 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 233 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 231 by the light-receiving till then through the 2nd switching device 281. And the integrating circuit 233 of the 1st analog signal readout circuitry 231 is accumulated in the capacitative element 237 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 233 becomes large gradually.
[0107] The outputted voltage signal is outputted to each A/D converter 241 (the 1st digital signal read-out section 240) from each 1st analog signal readout circuitry 231 as an analog signal through a CDS circuit etc. from an integrating circuit 233. In A/D converter 241, the analog signal outputted from the 1st analog signal readout circuitry 231 is changed into a digital signal, this digital signal is outputted to a data bus from each A/D converter 241 (the 1st digital signal read-out section 240), and data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction is ended. In case a digital signal is outputted from each A/D converter 241, based on the signal from a control circuit, each A/D converter 241 outputs a digital signal one by one to predetermined

timing, and is performing the scan in the 2nd direction. Since each 5th switching device 283 is opened, the analog signal outputted from the 1st analog signal readout circuitry 231 (the 1st analog signal read-out section 230) is not sent to the signal output terminal 291. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 231, it is also possible to perform a scan in the 2nd direction by making an analog signal output one by one from each 1st analog signal readout circuitry 231, using as significant the signal sent to each 6th switching device 284 one by one.

[0108] Subsequently, reset-signal R to an integrating circuit 233 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 4th switching device 239 and initializing a capacitative element 237.

[0109] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the digital signal as image pick-up data is acquired.

[0110] In the 2nd analog signal read-out section 250 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 281 is opened, each 3rd switching device 282 is closed, each 8th switching device 285 is closed, and each 9th switching device 286 is opened. Moreover, the 7th switching device 259 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 253 as significant, and a capacitative element 257 is initialized.

[0111] Next, the scan signal Sn is made significant to predetermined timing in the 7th switching device 259 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 253 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 2nd analog signal readout circuitry 251 (the 2nd analog signal read-out section 250) by the light-receiving till then through the 3rd switching device 282. And the integrating circuit 253 of the 2nd analog signal readout circuitry 251 is accumulated in the capacitative element 257 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 253 becomes large gradually.

[0112] Through a CDS circuit etc., the voltage signal outputted from the integrating circuit 253 is outputted as an analog signal from each 2nd analog signal readout circuitry 251 (the 2nd analog signal read-out section 250), and ends data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction. Since each 9th switching device 286 is opened, the analog signal outputted from the 2nd analog signal readout circuitry 251 (the 2nd analog signal read-out section 250) is not sent to the 2nd digital signal read-out section 260. In addition, in case an analog signal is outputted from each 2nd analog signal readout circuitry 251, the analog signal is made to output one by one from each 2nd analog signal readout circuitry 251, using as significant the signal sent to each 8th switching device 285 one by one, and the scan in the 2nd direction is performed.

[0113] Subsequently, reset-signal R to an integrating circuit 253 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 7th switching device 259 and initializing a capacitative element 257.

[0114] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the analog signal as image pick-up data is acquired.
[0115] On the other hand, in the 2nd digital signal read-out section 260 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 281 is opened, each 3rd switching device 282 is closed, each 8th switching device 285 is opened and each 9th switching device 286 is closed. Moreover, the 7th switching device 259 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 253 as significant, and a capacitative element 257 is initialized.
[0116] Next, the scan signal Sn is made significant to predetermined timing in the 7th switching device 259 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 253 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 2nd analog signal readout circuitry 251 by the light-receiving till then through the 3rd switching device 282. And the integrating circuit 253 of the 2nd analog signal readout circuitry 251 is accumulated in the capacitative element 257 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 253 becomes large gradually.
[0117] The outputted voltage signal is outputted to each A/D converter 241 (the 2nd digital signal read-out section 260) from each 2nd analog signal readout circuitry 251 as an analog signal through a CDS circuit etc. from an integrating circuit 253. In A/D converter 241, the analog signal outputted from the 2nd analog signal readout circuitry 251 is changed into a digital signal, this digital signal is outputted to a data bus from each A/D converter 241 (the 2nd digital signal read-out section 260), and data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction is ended. In case a digital signal is outputted from each A/D converter 241, based on the signal from a control circuit, each A/D converter 241 outputs a digital signal one by one to predetermined timing, and is performing the scan in the 2nd direction. Since each 8th switching device 285 is opened, the analog signal outputted from the 2nd analog signal readout circuitry 251 (the 2nd analog signal read-out section 250) is not sent to the signal output terminal 293. In addition, in case an analog signal is outputted from each 2nd analog signal readout circuitry 251, it is also possible to perform a scan in the 2nd direction by making an analog signal output one by one from each 2nd analog signal readout circuitry 251, using as significant the signal sent to each 6th switching device 284 one by one.
[0118] Subsequently, reset-signal R to an integrating circuit 253 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 7th switching device 259 and initializing a capacitative element 257.
[0119] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the digital signal as image pick-up data is acquired.
[0120] As mentioned above, according to the solid state camera 201 of the 3rd operation gestalt, the 1st shift register 50 is formed along with 3rd side 20c of the light sensing portion 20 by which two-dimensional array of the 21n [ of photo detectors ] .n was

carried out to the N line xN train, and the 2nd shift register 60 is formed along the 20d of the 4th side of a light sensing portion 20. Moreover, this 1st shift register 50 and 2nd shift register 60 Since the scan signal Sn is outputted so that it can be sent out, even if it turns to any of the 1st signal output terminal 27 of 22n of each unit light sensing portion, and the 2nd signal output terminal 29 the current signal generated with each photodiode 23 When closing and each 3rd switching device 282 are opened, both the 1st shift register 50 and the 2nd shift register 60 each 2nd switching device 281 The current signal generated in 22n (photodiode 23 arranged in the 1st direction) of each unit light sensing portion is turned and sent out to the 1st analog signal read-out section 230. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 1st analog signal read-out section 230, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 1st analog signal read-out section 230, and becomes things.

[0121] Similarly, the current signal with which both the 1st shift register 50 and the 2nd shift register 60 generated each 2nd switching device 281 in 22n of each unit light sensing portion when an aperture and each 3rd switching device 282 were closed is turned and sent out to the 2nd analog signal read-out section 250. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 2nd analog signal read-out section 250, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 2nd analog signal read-out section 250, and becomes things.

[0122] therefore, even when either the 1st shift register 50 and the 2nd shift register 60 have a defect The 1st shift register 50 and the 2nd shift register 60 either on the other hand It becomes possible to send out the current signal generated in 22n of each unit light sensing portion towards the 1st analog signal read-out section 230 or the 2nd analog signal read-out section 250. A light sensing portion 20 is large-area-ized. [ when the circumference circuit of the 1st analog signal read-out section 230, the 1st digital signal read-out section 240, the 2nd analog signal read-out section 250, the 2nd digital signal read-out section 260, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 210 ] Lowering of the yield of ********** 1 can be controlled.

[0123] Moreover, the 1st shift register 50 and the 2nd shift register 60 will be formed in the location whose light sensing portion 20 was pinched and which counters, and can constitute a substrate 210 from forming the 1st shift register 50 along with 3rd side 20c, and forming the 2nd shift register 60 along the 20d of the 4th side in a compact.

[0124] Moreover, the 1st analog signal read-out section 230 is formed along with 1st side 20a of a light sensing portion 20, the 1st digital signal read-out section 240 is formed along with the 1st analog signal read-out section 230, the 2nd analog signal read-out section 250 is formed along with 2nd side 20b which counters 1st side 20a of a light sensing portion 20, and the 2nd digital signal read-out section 260 is formed along with the 2nd analog signal read-out section 250. Moreover, the 1st analog signal read-out section 230 The signal outputted from the 1st signal output terminal 27 of 22n of each

unit light sensing portion is inputted according to an individual, respectively. It has the 1st analog signal readout circuitry 231 of N individual which reads the current signal outputted from 22n of unit light sensing portions as an analog signal. The 1st digital signal read-out section 240 It has A/D converter 241 of N individual which changes into a digital signal the analog signal outputted from each 1st analog signal readout circuitry 231. The 2nd analog signal read-out section 250 The signal outputted from the 2nd signal output terminal 29 of 22n of each unit light sensing portion is inputted according to an individual, respectively. It has the 2nd analog signal readout circuitry 251 of N individual which reads the current signal outputted from 22n of unit light sensing portions as an analog signal. The 2nd digital signal read-out section 260 It has A/D converter 241 of N individual which changes into a digital signal the analog signal outputted from each 2nd analog signal readout circuitry 251. When closing and each 3rd switching device 282 are closed for each 2nd switching device 281 and an aperture and each 6th switching device 284 are closed for an aperture and each 5th switching device 283 The 1st shift register 50 or the 2nd shift register 60 will send out a current signal towards the 1st signal output terminal 27 side. Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as a digital signal in each 1st digital signal read-out section 240.

[0125] On the other hand, when either of A/D converters 241 of the 1st digital signal read-out section 240, for example, N individual, has a defect Closing and each 3rd switching device 282 for each 2nd switching device 281 An aperture, By turning each 5th switching device 283 to closing, turning each 6th switching device 284 to the 1st signal output terminal 27 side with an aperture, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as an analog signal by each 1st analog signal readout circuitry 231 (the 1st analog signal read-out section 230).

[0126] When the 1st digital signal read-out section 240 and the 1st analog signal read-out section 230 have a defect An aperture and each 3rd switching device 282 for each 2nd switching device 281 Closing, By turning each 8th switching device 285 to an aperture, turning each 9th switching device 286 to the 2nd signal output terminal 29 side with closing, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as a digital signal in each 2nd digital signal read-out section 260.

[0127] furthermore, when the 1st digital signal read-out section 240, the 1st analog signal read-out section 230, and the 2nd digital signal read-out section 260 have a defect An aperture and each 3rd switching device 282 for each 2nd switching device 281 Closing, By turning each 8th switching device 285 to closing, turning each 9th switching device 286 to the 2nd signal output terminal 29 side with an aperture, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as an analog signal by each 2nd analog signal readout circuitry 251 (the 2nd analog signal read-out section 250).

[0128] therefore, when the 1st digital signal read-out section 240 side has a defect It becomes possible to read the current signal generated with the photodiode 23 in the 1st

analog signal read-out section 230 side. moreover, even when the 1st digital signal read-out section 240 and the 1st analog signal read-out section 230 have a defect Moreover, it becomes possible to read the current signal generated with the photodiode 23 in the 2nd digital signal read-out section 260 side. furthermore, even when the 1st digital signal read-out section 240, the 1st analog signal read-out section 230, and the 2nd digital signal read-out section 260 have a defect Moreover, it becomes possible to read the current signal generated with the photodiode 23 in the 2nd analog signal read-out section 250 side. A light sensing portion 20 is large-area-ized. [ when the circumference circuit of the 1st analog signal read-out section 230, the 1st digital signal read-out section 240, the 2nd analog signal read-out section 250, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 210 ] Lowering of the yield of ********** 201 can be controlled substantially.

[0129] Moreover, since it becomes a digital output in reading the current signal generated with the photodiode 23 in the 1st digital signal read-out section 240 or 2nd digital signal read-out section 260 side, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera 201 of it is attained. Moreover, the resolution in the 1st digital signal read-out section 240 From a tooth-space-problem to make it high, since it is prepared in the same substrate 210 A limitation Although there is (for example, resolution of about 11 bits), in reading the current signal generated with the photodiode 23 in the 1st analog signal read-out section 230 or 2nd analog signal read-out section 250 side By using an external A/D converter, high-resolution-ization (for example, resolution of about 16 bits) is attained.

[0130] Moreover, along with 1st side 20a, the 1st analog signal read-out section 230 (the 1st digital signal read-out section 240) is formed. By forming the 2nd analog signal read-out section 250 (the 2nd digital signal read-out section 260) along with 2nd side 20b It will be prepared in the location where the light sensing portion 20 of the 2nd analog signal read-out section [ the 1st analog signal read-out section 230 (the 1st digital signal read-out section 240) and ] 250 (the 2nd digital signal read-out section 260) was pinched and which counters. A substrate 210 can be further constituted in a compact.

[0131] (The 4th operation gestalt) Next, the 4th operation gestalt of the solid state camera concerning this invention is explained using drawing 7 and drawing 8 . Drawing 7 is the conceptual diagram showing the outline configuration of the solid state camera concerning the 4th operation gestalt, and drawing 8 is circuitry drawing of the solid state camera concerning the 4th operation gestalt. The solid state camera 301 concerning the 4th operation gestalt is different compared with the solid state camera 1 concerning the 1st operation gestalt in that the analog signal read-out section and the digital signal read-out section are prepared in the one-side side of a light sensing portion 20.

[0132] As the solid state camera 301 concerning the 4th operation gestalt is shown in drawing 7 , it has the substrate 310 formed in the rectangle, and a light sensing portion 20, the 1st analog signal read-out section 330, the 1st digital signal read-out section 340, the 1st shift register 50, and the 2nd shift register 60 are formed in this substrate 310 using the CMOS process etc. The silicon wafer of 8 inch phi is used for the substrate 310.

[0133] The light sensing portion 20 is formed in the abbreviation square configuration where each side was set to 130mm, and 211.1-21N (pixel) .N of each photo detector is formed with 50 micrometer pitch extent of every direction in this. The 1st analog signal read-out section 330 is formed along with 1st side 20a of a light sensing portion 20. The

1st digital signal read-out section 340 is formed along with the 1st analog signal read-out section 330 prepared along with 1st side 20a of a light sensing portion 20. The 1st shift register 50 is formed along with 3rd side 20c which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b. The 2nd shift register 60 is formed along the 20d of the 4th side which intersects perpendicularly with the 1st side 20a of a light sensing portion 20, and 2nd side 20b, and counters 3rd side 20c. The signal output terminal 380,390 is respectively connected to the 1st analog signal read-out section 330 and the 1st digital signal read-out section 340.

[0134] As a light sensing portion 20 is shown in drawing 2 , two-dimensional array of the 21n [ of photo detectors ] .n is carried out to the N line xN train. 211.1-21N .N of each photo detector has the photodiode 23 as an optoelectric transducer which changes an input lightwave signal into a current signal, and the 1st switching device 25. It has the signal input terminal and the signal output terminal, the signal input terminal of the 1st switching device 25 is connected to the signal output terminal of a photodiode 23, and the 1st switching device 25 flows out of a signal output terminal the current signal generated with the photodiode 23 according to the scan signal Sn from the 1st shift register 50 or the 2nd shift register 60. N individual array is carried out along the 1st direction (the 3rd side 20c or the extending direction of the 20d of the 4th side), such 21n [ of photo detectors ] .n gets down, and 21n [ of photo detectors by which N individual array was carried out along this 1st direction ] . 1-21n.N constitutes 22n of unit light sensing portions by connecting electrically the signal output terminal of each 1st switching device 25. N individual array of the 22n of this unit light sensing portion is carried out along the 1st direction and the 2nd direction (direction where the 1st side 20a or 2nd side 20b is prolonged) which intersects perpendicularly.

[0135] The 1st signal output terminal 27 mutually connected with the signal output terminal of each 1st switching device 25 electrically is formed in one edge of 22n of each unit light sensing portion. Each 1st signal output terminal 27 is connected to the 1st analog signal read-out section 30 through the 2nd switching device 371. Corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, N individual array of this 2nd switching device 371 is carried out in the 2nd direction. Moreover, the 2nd switching device 371 operates according to the signal from a control circuit (not shown). In addition, this 2nd switching device 371 may be omitted.

[0136] The 1st analog signal read-out section 330 has the 1st analog signal readout circuitry 331, as shown in drawing 2 . N individual array is carried out corresponding to the number (the number of the photodiodes 23 arranged in the 2nd direction) of 22n of unit light sensing portions, and this 1st analog signal readout circuitry 331 is formed in the 2nd direction in the shape of an array. Each 1st analog signal readout circuitry 331 has the integrating circuit 333, the CDS circuit (not shown), etc. The charge sensitive amplifier 335 which an integrating circuit 333 inputs the output signal from 22n (the 1st signal output terminal 27) of unit light sensing portions, and amplifies the inputted charge of a current signal, The capacitative element 337 by which one terminal was connected to the input terminal of a charge sensitive amplifier 335, and the other-end child was connected to the output terminal of a charge sensitive amplifier 335, One terminal is connected to the input terminal of a charge sensitive amplifier 335, and an other-end child is connected to the output terminal of a charge sensitive amplifier 335. Reset-signal

R outputted from a control circuit will be in "ON" condition, when significant, and when reset-signal R is non-****, it has the 3rd switching device 339 which will be in an "OFF" condition. When reset-signal R is non-****, the output signal from 22n of unit light sensing portions is inputted, an integral is operated to the capacitative element 337 to which the current signal outputted from 22n of unit light sensing portions according to reset-signal R was connected between input/output terminals, and as for this integrating circuit 333, reset-signal R comes to operate un-finding the integral, in being significant.
[0137] Reading appearance of the current signal from 22n (the 1st signal output terminal 27) of unit light sensing portions is carried out by the 1st analog signal readout circuitries 331 (an integrating circuit 333, CDS circuit, etc.) as an analog signal, and this analog signal is sent out towards the signal output terminal 380. The 4th switching device 372 is formed in the latter part (between the signal output terminals 380) of each 1st analog signal readout circuitry 331. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 331, and this 4th switching device 372 operates according to the signal from a control circuit.
[0138] Moreover, the analog signal in which reading appearance was carried out by the 1st analog signal readout circuitry 331 is sent out even if it turns to the 1st digital signal read-out section 340. The 5th switching device 373 is formed between each 1st analog signal readout circuitry 331 and the 1st digital signal read-out section 340. N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 331, and this 5th switching device 373 operates according to the signal from a control circuit. Here, the 4th switching device 372 and 5th switching device 373 constitute the 1st output selection means in each claim.
[0139] The 1st digital signal read-out section 340 has A/D converter 341, N individual array is carried out corresponding to the number of the 1st analog signal readout circuitries 331, and this A/D converter 341 is formed in the 2nd direction in the shape of an array. Each A/D converter 341 inputs the analog signal outputted from each 1st analog signal readout circuitry 331, changes this analog signal into a digital signal, and sends it out towards the signal output terminal 390 through a data bus.
[0140] Next, actuation of the solid state camera 301 of the 4th operation gestalt is explained. In this solid state camera 301, the light figure which the light the light sensing portion 20 carried out [ light ] incidence forms is inputted, and the charge according to light income is accumulated in the photodiode 23 of a light sensing portion 20. And the amount of charges accumulated in each photodiode 23 is read as follows after progress of a predetermined light-receiving period.
[0141] In the 1st analog signal read-out section 330 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 371 is closed, each 4th switching device 372 is closed, and each 5th switching device 373 is opened. Moreover, the 3rd switching device 339 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 333 as significant, and a capacitative element 337 is initialized.
[0142] Next, the scan signal Sn is made significant to predetermined timing in the 3rd switching device 339 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 333 as un-significant. The scan signal Sn which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing

portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 331 (the 1st analog signal read-out section 330) by the light-receiving till then through the 2nd switching device 71. And the integrating circuit 333 of the 1st analog signal readout circuitry 331 is accumulated in the capacitative element 337 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 333 becomes large gradually.

[0143] Through a CDS circuit etc., the voltage signal outputted from the integrating circuit 333 is outputted as an analog signal from each 1st analog signal readout circuitry 331 (the 1st analog signal read-out section 330), and ends data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction. Since each 5th switching device 373 is opened, the analog signal outputted from the 1st analog signal readout circuitry 331 (the 1st analog signal read-out section 330) is not sent to the 1st digital signal read-out section 340. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 331, the analog signal is made to output one by one from each 1st analog signal readout circuitry 331, using as significant the signal sent to each 4th switching device 372 one by one, and the scan in the 2nd direction is performed.

[0144] Subsequently, reset-signal R to an integrating circuit 333 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 3rd switching device 339 and initializing a capacitative element 337.

[0145] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the analog signal as image pick-up data is acquired.

[0146] On the other hand, in the 1st digital signal read-out section 340 side, when reading the amount of charges accumulated in each photodiode 23, first, by the signal from a control circuit, each 2nd switching device 371 is closed, each 4th switching device 372 is opened and each 5th switching device 373 is closed. Moreover, the 3rd switching device 339 is closed in advance of activation of read-out, using reset-signal R to an integrating circuit 333 as significant, and a capacitative element 337 is initialized.

[0147] Next, the scan signal Sn is made significant to predetermined timing in the 3rd switching device 339 at each 1st switching device 25 from either an aperture, the 1st shift register 50 and the 2nd shift register 60, using reset-signal R to an integrating circuit 333 as un-significant. The scan signal S1 which sets only the 1st switching device [ 1st ] 25 of photo detector 211.1-21N.1 in a scan in the 1st direction of 22n of each unit light sensing portion to "ON" is made significant. If the 1st switching device 25 serves as "ON", the charge accumulated in the photodiode 23 will serve as a current signal, and will be outputted to the 1st analog signal readout circuitry 331 by the light-receiving till then through the 2nd switching device 371. And the integrating circuit 333 of the 1st analog signal readout circuitry 331 is accumulated in the capacitative element 337 which is the feedback capacity, and the voltage signal outputted from the output terminal of an integrating circuit 333 becomes large gradually.

[0148] The outputted voltage signal is outputted to each A/D converter 341 (the 1st digital signal read-out section 340) from each 1st analog signal readout circuitry 331 as an analog signal through a CDS circuit etc. from an integrating circuit 333. In A/D converter 341, the analog signal outputted from the 1st analog signal readout circuitry 331 is changed into a digital signal, this digital signal is outputted to a data bus from each

A/D converter 341 (the 1st digital signal read-out section 340), and data read-out about the 1st photo detector 211.1-21N.1 in a scan in the 1st direction is ended. In case a digital signal is outputted from each A/D converter 341, based on the signal from a control circuit, each A/D converter 341 outputs a digital signal one by one to predetermined timing, and is performing the scan in the 2nd direction. Since each 4th switching device 372 is opened, the analog signal outputted from the 1st analog signal readout circuitry 331 (the 1st analog signal read-out section 330) is not sent to the signal output terminal 380. In addition, in case an analog signal is outputted from each 1st analog signal readout circuitry 331, it is also possible to perform a scan in the 2nd direction by making an analog signal output one by one from each 1st analog signal readout circuitry 331, using as significant the signal sent to each 5th switching device 373 one by one.

[0149] Subsequently, reset-signal R to an integrating circuit 333 is made significant, and data read-out about 211.n-21N [ of photo detectors ] .n of the 2nd henceforth in a scan in the 1st direction is performed, closing the 3rd switching device 339 and initializing a capacitative element 337.

[0150] In this way, the light figure which the light inputted into the light sensing portion 20 forms is picturized, and the digital signal as image pick-up data is acquired.

[0151] As mentioned above, according to the solid state camera 301 of the 4th operation gestalt, the 1st shift register 50 is formed along with 3rd side 20c of the light sensing portion 20 by which two-dimensional array of the 21n [ of photo detectors ] .n was carried out to the N line xN train, and the 2nd shift register 60 is formed along the 20d of the 4th side of a light sensing portion 20. Moreover, this 1st shift register 50 and 2nd shift register 60 Since the scan signal Sn is outputted so that it can be sent out, even if it turns to any of the 1st signal output terminal 27 of 22n of each unit light sensing portion, and the 2nd signal output terminal 29 the current signal generated with each photodiode 23 When each 2nd switching device 371 is closed, both the 1st shift register 50 and the 2nd shift register 60 The current signal generated in 22n (photodiode 23 arranged in the 1st direction) of each unit light sensing portion is turned and sent out to the 1st analog signal read-out section 330. Thereby, when the 1st shift register 50 has a defect, the current signal generated in 22n of each unit light sensing portion with the 2nd shift register 60 is sent out towards the 1st analog signal read-out section 330, and becomes things. On the other hand, when the 2nd shift register 60 has a defect, the current signal generated in 22n of each unit light sensing portion with the 1st shift register 50 is sent out towards the 1st analog signal read-out section 330, and becomes things.

[0152] therefore, even when either the 1st shift register 50 and the 2nd shift register 60 have a defect The 1st shift register 50 and the 2nd shift register 60 either on the other hand It becomes possible to send out the current signal generated in 22n of each unit light sensing portion towards the 1st analog signal read-out section 330. A light sensing portion 20 is large-area-ized. When the circumference circuit of the 1st analog signal read-out section 330, the 1st digital signal read-out section 340, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 310, lowering of the yield of a solid state camera 1 can be controlled.

[0153] Moreover, the 1st shift register 50 and the 2nd shift register 60 will be formed in the location whose light sensing portion 20 was pinched and which counters, and can constitute a substrate 310 from forming the 1st shift register 50 along with 3rd side 20c, and forming the 2nd shift register 60 along the 20d of the 4th side in a compact.

[0154] Moreover, the 1st analog signal read-out section 330 is formed along with 1st side 20a of a light sensing portion 20, and the 1st digital signal read-out section 340 is formed along with the 1st analog signal read-out section 330. The 1st analog signal read-out section 330 inputs the signal outputted from the 1st signal output terminal 27 of 22n of each unit light sensing portion according to an individual, respectively, it has the 1st analog signal readout circuitry 331 of N individual which reads the current signal outputted from 22n of unit light sensing portions as an analog signal, and the 1st digital signal read-out section 340 has A/D converter 341 of N individual which changes into a digital signal the analog signal outputted from each 1st analog signal readout circuitry 331. When closing is closed for each 2nd switching device 371 and an aperture and each 5th switching device 373 are closed for each 4th switching device 372, the 1st shift register 50 or the 2nd shift register 60 will send out a current signal towards the 1st signal output terminal 27 side, and reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as a digital signal in each 1st digital signal read-out section 340.
[0155] On the other hand, when either of A/D converters 341 of the 1st digital signal read-out section 340, for example, N individual, has a defect Closing and each 4th switching device 372 for each 2nd switching device 371 Closing, By turning each 5th switching device 373 to the 1st signal output terminal 27 side with an aperture, the 1st shift register 50, or the 2nd shift register 60, and sending out a current signal Reading appearance of the current signal generated with the photodiode 23 in 22n of each unit light sensing portion will be carried out as an analog signal by each 1st analog signal readout circuitry 331 (the 1st analog signal read-out section 330).
[0156] therefore, when the 1st digital signal read-out section 340 side has a defect It becomes possible to read the current signal generated with the photodiode 23 in the 1st analog signal read-out section 330 side. A light sensing portion 20 is large-area-ized. When the circumference circuit of the 1st analog signal read-out section 330, the 1st digital signal read-out section 340, the 1st shift register 50, and 2nd shift register 60 grade is established in the same substrate 310, lowering of the yield of a solid state camera 1 can be controlled further.
[0157] Moreover, since it becomes a digital output in reading the current signal generated with the photodiode 23 in the 1st digital signal read-out section 340 side, read-out of the current signal in a high speed is possible, an external A/D converter becomes unnecessary and low cost-ization of a solid state camera 1 of it is attained. Moreover, since it is prepared in the same substrate 310, although there is a limitation (for example, resolution of about 11 bits) in making it high from a tooth-space-problem, when reading the current signal generated with the photodiode 23 in the 1st analog signal read-out section 330 side side, the resolution in the 1st digital signal read-out section 340 is using an external A/D converter, and high-resolution-ization (for example, resolution of about 16 bits) of it is attained.
[0158] Moreover, along with 1st side 20a, the 1st analog signal read-out section 330 is formed, and the 1st analog signal read-out section 330 and the 1st digital signal read-out section 340 will be formed in the 1st [ of a light sensing portion 20 ] side 20a side, and can constitute a substrate 310 from forming the 1st digital signal read-out section 340 along with the 1st analog signal read-out section 330 in a compact further.
[0159] In the solid state image pickup device of charge coupling molds, such as CCD, the

charge generated in the photo detector moves based on the potential difference formed in the transfer section. For this reason, when a defect exists in some wafers, it becomes impossible to form a potential difference in the part in which a defect exists, and the signal for one train of the transfer section cannot be transmitted. Therefore, the train in which a defect exists serves as a deadline, and the probability to generate this deadline the more the more the area of a light sensing portion becomes large becomes high. Consequently, large area-ization of the light sensing portion in CCD will become expensive, in order the yield is very bad and to improve the yield. However, as the 1st operation gestalt - 4th operation gestalt showed, in the solid state camera concerning this invention, lowering of the yield is controlled and large area-ization of a light sensing portion is attained.

[0160] In addition, in the 1st operation gestalt - 4th operation gestalt, although 21n [ of photo detectors ] .n forms in a substrate the light sensing portion 20 by which two-dimensional array was carried out to the N line xN train, without restricting a light sensing portion 20 to this, the light sensing portion by which two-dimensional array of the photo detector was carried out to the N line xM train (N!=M) may be used, and the configuration is not restricted to a square, for example, either.

[0161]

[Effect of the Invention] As mentioned above, according to the solid state camera of this invention, when forming a light sensing portion and a circumference circuit in the same substrate, lowering of the yield is controlled, and the solid state camera in which large-area-izing of a light sensing portion is possible can be realized as explained to the detail.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the conceptual diagram showing the outline configuration of the 1st operation gestalt of the solid state camera concerning this invention.

[Drawing 2] It is circuitry drawing of the 1st operation gestalt of the solid state camera concerning this invention.

[Drawing 3] It is the conceptual diagram showing the outline configuration of the 2nd operation gestalt of the solid state camera concerning this invention.

[Drawing 4] It is circuitry drawing of the 2nd operation gestalt of the solid state camera concerning this invention.

[Drawing 5] It is the conceptual diagram showing the outline configuration of the 3rd operation gestalt of the solid state camera concerning this invention.

[Drawing 6] It is circuitry drawing of the 3rd operation gestalt of the solid state camera concerning this invention.

[Drawing 7] It is the conceptual diagram showing the outline configuration of the 4th operation gestalt of the solid state camera concerning this invention.

[Drawing 8] It is circuitry drawing of the 4th operation gestalt of the solid state camera concerning this invention.

[Description of Notations]

1,101,201,301 -- A solid state camera, 10,110,210,310 -- Substrate, 20 [ -- The 3rd side, ]

-- A light sensing portion, 20a -- The 1st side, 20b -- The 2nd side, 20c 20d [ -- Photodiode, ] -- The 4th side, 21n.n -- A photo detector, 22n -- A unit light sensing portion, 23 25 -- The 1st switching device, 27 -- The 1st signal output terminal, 29 -- The 2nd signal output terminal, 30 -- The 1st analog signal read-out section, 31 -- The 1st analog signal readout circuitry, 33 -- An integrating circuit, 40 -- The 1st digital signal read-out section, 41 -- The 2nd analog signal read-out section, 42 -- The 2nd analog signal readout circuitry, 43 -- An integrating circuit, 47 -- The 1st digital signal converter, 48 -- An A/D converter, 50 -- The 1st shift register, 60 -- The 2nd shift register, 130 -- The 1st analog signal read-out section, 131 -- The 1st analog signal readout circuitry, 133 -- An integrating circuit, 140 -- The 1st digital signal read-out section, 141 -- A/D converter, 150 -- The 2nd analog signal read-out section, 151 -- The 2nd analog signal readout circuitry, 153 -- An integrating circuit, 230 -- The 1st analog signal read-out section, 231 -- The 1st analog signal readout circuitry, 233 -- An integrating circuit, 240 -- The 1st digital signal read-out section, 241 -- A/D converter, 250 -- The 2nd analog signal read-out section, 251 -- The 2nd analog signal readout circuitry, 253 -- An integrating circuit, 260 -- The 1st digital signal read-out section, 261 -- A/D converter, 330 [ -- The 1st digital signal read-out section, 341 / -- An A/D converter, Sn / -- Scan signal. ] -- The 1st analog signal read-out section, 331 -- The 1st analog signal readout circuitry, 333 -- An integrating circuit, 340